NAVAL TELECOMMUNICATIONS PROCEDURES

SPECTRUM MANAGEMENT MANUAL

NTP 6 (D)

NAVAL COMPUTER AND TELECOMMUNICATIONS COMMAND
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LETTER OF PROMULGATION

1. NTP 6(D), SPECTRUM MANAGEMENT MANUAL, was developed under the direction of the Commander, Naval Computer and Telecommunications Command, and is promulgated for U.S. Navy, Coast Guard and Marine Corps activities. NTP 6(D) updates the information formerly contained in NTP 6(C), and provides guidance and assistance to frequency management personnel in the conduct of their duties.

2. NTP 6(D) is an UNCLASSIFIED, non-registered publication.

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7. This publication has been reviewed and approved in accordance with SECNAV Instruction 5600.16.

KATHARINE LAUGHTON
Captain, U.S. Navy
Commander, Naval Computer and
Telecommunications Command

SPECTRUM MANAGEMENT MANUAL

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CHAPTER 1

INTRODUCTION TO SPECTRUM MANAGEMENT

101. SCOPE

a. The Spectrum Management Manual is published as the single manual of procedures for the effective execution of spectrum management within the Department of the Navy (DON). This manual provides an overview of organizational responsibilities and roles in the regulation of spectrum use and covers international, national, Department of Defense (DoD), and DON regulation of the use of the spectrum.

b. This manual is supplemented by NTP 6 SUPP-1( ), RECOMMENDED BANDS AND FREQUENCY GUIDE, published under separate cover. NTP 6 SUPP-1( ) provides an approach to propagation prediction for frequency planning that will ensure the maximum benefit from frequency predictions in establishing and maintaining high frequency communications circuits.

102. GENERAL

a. The COMNAVCOMTELCOM has the responsibility for developing, promulgating, and maintaining a manual of procedures for spectrum actions within the DON. This responsibility is executed by the Naval Electromagnetic Spectrum Center (NAVEMSCEN) for COMNAVCOMTELCOM. NAVEMSCEN is publishing this manual to assist commands and activities in the performance of their spectrum management functions.

b. The amount of energy an electronic transmitter radiates and the distance it travels depend on many factors. A small device may transmit energy the length of a driveway to automatically open a garage door, while a larger transmitter may transmit energy millions of kilometers for an in-flight correction of a deep space probe of Saturn's rings. Whatever the amount or purpose, energy is indiscriminate in its interference with other communications electronic operations. Because so much energy from so many sources is being radiated into space, effective interference-free operation can be ensured only if the use of these devices is regulated. Such regulation must cover spectrum procurement, allocation, assignment, scheduling, coordination, utilization, and protection. This spectrum manual discusses each of these areas in detail and presents specific procedures necessary for effective regulation within them.

c. All Naval commands, organizations, and activities will comply with the spectrum management policies and procedures promulgated by COMNAVCOMTELCOM.

103. THE ELECTROMAGNETIC SPECTRUM

a. In the past quarter century, the world has seen the use of electronics pervade virtually every phase of human activity. Electronic devices, especially those that radiate, make constant use of the electromagnetic spectrum. Whether two children are talking across the yard with walkie-talkies or two heads of state are conversing across the ocean, some portion of the frequency spectrum is used. Indeed, the electronic transmission of voice, data, and the printed word is essential for air and sea travel, the exploration of space, public safety, education, entertainment, and a myriad of business and industry, military, and private purposes.

b. Electromagnetic spectrum refers to natural vibrations that occur when a force is applied to a substance. These vibrations occur with various speeds and intensities. The speed at which they occur is called frequency, and the distance between each vibration is the wavelength. The vibrations can occur at intervals of a few vibrations per second, such as the vibrations produced by an earthquake, or a few billion vibrations per second such as the vibrations produced by an X-ray machine.

c. The vibrations that represent the spectrum are often likened to the waves that emanate from a pebble that is dropped into the water. The number of waves passing a point that is a fixed distance from the location of pebble entry represents frequency, and the distance between waves represents wavelength. Frequency and wavelength are not fixed quantities. They change according to the variables involved. In the case of the pebble, the density of the water, the size of the pebble, and the force with which it strikes the water will determine the frequency and wavelength of the resulting vibrations. The same applies to electronic transmitters. The power, tuning, and type of antenna will determine the resulting frequency and wavelength.

d. Familiar human experiences can help relate to various parts of the electromagnetic spectrum. We can see because of visible light at about 10^6 GHz; we get sunburn from ultraviolet radiations at 10^7 GHz; we are warmed and are able to see at night by infrared at 10^4 GHz; we hear sounds such as talking, music, and noise at between 20 to 20,000 Hz; and we feel the vibrations of an earthquake at less than 10 Hz. The primary concern in this manual is the use of the spectrum for communications, radar, and infrared detection, weapons control, navigation, and electronic warfare. For these applications, the equipment and systems receive and radiate energy through antennas and depend on some portion of the frequency spectrum for support. We sometimes communicate from antenna systems to submarines and from ship-to-shore by high frequency radio; at the higher frequencies, we transmit television signals and communicate over long distances by geostationary satellites; some communications use the ionosphere and troposphere to reflect energy back to the ground for long-distance communications, and some stations communicate by direct line-of-sight. A tabular representation of the spectrum is shown in Table 1-1.

104. NEED FOR SPECTRUM MANAGEMENT

a. There was a great invention in the 19th century that ultimately led to the need for spectrum management. In those days, it was called the wireless; today, the radio. Initially, there were only two radio frequencies--50 kilohertz (kHz) and 1,000 kHz. Today, however, the spectrum is recognized by international treaty to extend up to 3000 gigahertz (GHz). Other historical events have, since the wireless, contributed to the need for frequency management. For example, the world wars, the invention of radar, launching of Sputnik, etc. The innumerable items of electronic equipment necessary to support these events place great demands on the spectrum.

b. Electronic equipment amounts to a very large portion of the Government's annual budget; television revenue is at an all-time high; and there are approximately 18 million Federal Communications Commission (FCC) transmitters in service. The U.S. Navy alone has over a quarter million transmitting devices competing for space in the frequency spectrum.

c. If every operator could turn on a transmitter whenever desired without some type of regulation, at least two serious problems would result. First, any reception by the intended receiver would be by coincidence, since the receiving operators would not know where to tune their equipment. Second, other receivers would receive unwanted signals, a phenomenon called electromagnetic interference (EMI). Prevention of these two situations calls for regulating the use of the electromagnetic spectrum. Regulation takes place through a hierarchical arrangement that includes international, national, DoD, and military service regulations of the electromagnetic spectrum.

FREQUENCY BAND		**APPLICATION**
Below 3 kHz	Extremely Low Frequency (ELF)	Very long range point-to-communications.
3-30 kHz	Very Low Frequency (VLF)	Long range communications generally considered as greater than 185 kilometers (100 nautical miles)).
30-300 kHz	Low Frequency (LF)	Long and medium range communications (93-1852 kilometers (50-1000 nautical miles)). Radio-navigation.
300-3000 kHz	Medium Frequency (MF)	Broadcast, maritime communications, maritime navigation, coastal radio-telephone, medium and short range communications.
3-30 MHz	High Frequency (HF)	Medium and long-range communications.
30-300 MHz	Very High Frequency (VHF)	Short range (line-of-sight (LOS)) communications, over-horizon "scatter" communications, television, radar, aeronautical radio-navigation.
300-3000 MHz	Ultra High Frequency (UHF)	Short range communications, over-horizon "scatter" communications, television, radar, point-to-point relay systems.
3-30 GHz	Super High Frequency (SHF)	Radar, radionavigation, point-to-point relay systems, satellite relay systems.
30-300 GHz	Extremely High Frequency (EHF)	Radar, radionavigation.

TABULAR REPRESENTATION OF THE SPECTRUM

TABLE 1-1

CHAPTER 2

INTERNATIONAL, NATIONAL, AND DoD REGULATION

201. INTERNATIONAL REGULATION

202. HISTORY OF THE INTERNATIONAL TELECOMMUNICATION UNION

a. Electromagnetic waves do not stop at the borders that man has created to separate the nations of the world. Consequently, the International Telecommunication Union (ITU) was created to regulate the use of the spectrum and thereby create conditions in which interference-free operation can take place.

b. The ITU, consisting of many member countries, dates back to the mid-1800s. Its beginning was influenced by the invention of the first telegraph, the Chappe Semaphone, by Claude Chappe in France in 1794. Much work was done to develop the telegraph over the next 40 years, and a major breakthrough occurred in 1838 with the demonstration of Samuel F. B. Morse's new key telegraph. His invention quickly became widely used, and in 1865, the first intercontinental land line, stretching from New York to Paris, was installed. This installation of the New York-Paris line led to the 1865 International Telegraph Convention held in Paris that same year, thus triggering the development of the ITU as we know it today. The radio, telephone, and the launching of the first satellite, Sputnik, played a large role in the development of ITU following its inception in 1865.

203. PURPOSE AND STRUCTURE OF THE ITU

a. The ITU has three main functions. First, it establishes international cooperation to ensure improvement and rational use of the telecommunication of all kinds. Second, it promotes development and operation of telecommunication support facilities. Effective operation of these facilities improves the efficiency of telecommunication services and keeps problems at a minimum, thereby making the services more useful to the general public. Third, the ITU coordinates and harmonizes the actions of all nations in accomplishing the objective of providing adequate services to meet all requirements. It accomplishes these purposes through the establishment and maintenance of the International Radio Regulations. The ITU is made up of:

(1) Plenipotentiary Conference

(2) Administrative Conferences

(3) Administrative Council

(4) General Secretariat

(5) International Frequency Registration Board (IFRB)

(6) The International Radio, and Telegraph and Telephone Consultative Committees

b. The Plenipotentiary Conference determines the general policies for effective functioning of the union. It reviews the work of the Union, establishes and monitors its budget, elects the Administrative Council, and elects the Secretary and Deputy Secretaries General. The Conference meets about once every five years.

c. The Administrative Conferences, called World Administrative Radio Conferences (WARCs), are responsible for reviewing and updating radio regulations. They meet every 10 to 20 years to get member nations' agreement and incorporate decisions made by special conferences; to reconsider some provisions of the regulations as a result of technical advances; and to undertake a general revision of the regulations.

d. The 41 members of the Administrative Council meet annually in Geneva to decide what steps are necessary to ease the implementation of the provisions of the ITU conventions. The council ensures coordination of the work of the union and promotes assistance to new a developing countries in the area of telecommunication.

e. The General Secretariat provides the administration of the union. It schedules meetings and provides secretariats to conferences, does all secretarial work, maintains up-to-date lists and records, and publishes records and reports.

f. The International Frequency Registration Board (IFRB) is comprised of five independent members elected by the Plenipotentiary Conference. It is the official point of record for the date, purpose, and technical characteristics of frequency assignments made by the different countries. The board also provides advice on the maximum number of channels in each spectrum segment.

g. The International Radio, and Telephone and Telegraph Consultative Committees and their study groups are responsible for resolving any technical issues the Conferences refer to them. Their findings are provided in the form of recommendations.

204. NATIONAL REGULATION

Figure 2-1 depicts national, DoD and DON frequency management channels. Details concerning the responsibilities, functions, and general procedures for the various organizations are contained in the following paragraphs and Chapter 3.

205. NATIONAL POLICY

a. The Communications Act of 1934 established the framework for national regulation of the use of the frequency spectrum. Under that Act, the FCC regulates non-government use of the spectrum. Government use is directed by the Assistant Secretary of Commerce for Communications and Information and is actually carried out by the National Telecommunication and Information Administration (NTIA).

b. It is the policy of the United States to use the radio spectrum to assist in the achievement of the national goals. Electronic communications are vital to security and the welfare of the nation and to the conduct of foreign affairs. Consistent with our international treaty obligations and with due regard for rights of other nations, the U.S. national objectives are to make effective use of the spectrum in the best interest of the following specific objectives:

(1) Enhance the conduct of foreign affairs.

(2) Serve the national security and defense.

(3) Safeguard life and property.

(4) Support crime prevention.

(5) Support transportation systems.

(6) Foster conservation.

(7) Provide dissemination of information and entertainment.

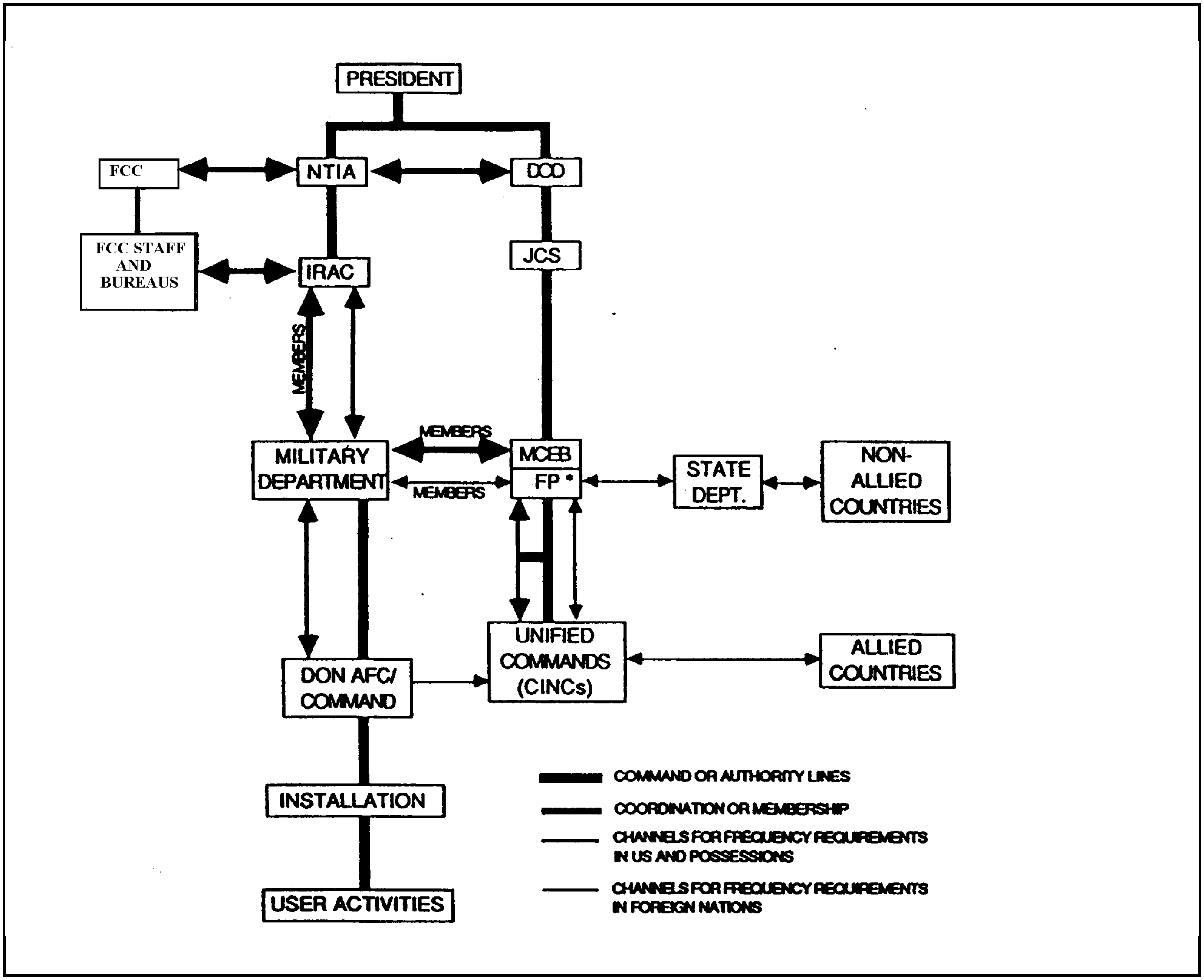
(8) Make worldwide radio communication available.

(9) Promote research, development, and exploration.

(10) Stimulate social and economic growth.

(11) Improve the overall well-being of man.

c. The FCC and NTIA work together in fulfilling their respective responsibilities.



* The Frequency Panel (FP) includes the following service representatives: Army, Air Force, Navy, Coast Guard, Marine Corps.

Figure 2-1. DoD Frequency Management Commands

206. FEDERAL COMMUNICATIONS COMMISSION

The FCC, in regulating non-government use of the spectrum in accordance with the established National Table of Frequency Allocations, is responsible for:

a. Assigning space in the RF spectrum to private users, such as public radio and TV stations.

b. Regulating the use of space assigned to private users.

c. Authorizing both U. S. and foreign amateur operators, who are licensed by their governments, to operate in the United States under reciprocal arrangements.

d. Providing a liaison representative to the various NTIA subcommittees and working groups.

e. Coordinating with the Government (NTIA) on non-government use in shared bands and in other bands that might have an impact on Government operations.

207. NATIONAL TELECOMMUNICATION AND INFORMATION ADMINISTRATION

a. The Department of Commerce Organization Order 10-10 of May 9, 1978, transferred the functions relating to the authorization of frequencies to radio stations belonging to and operated by the United States to the Assistant Secretary of Commerce for Communications and Information (Administrator, NTIA). The Administrator, NTIA, performs the following functions:

(1) Serves as the President's principal advisor on telecommunication policies pertaining to the Nation's economic and technological advancement and to the regulation of the telecommunication industry.

(2) Advises the Director, Office of Management and Budget (OMB), on the development of policies for procurement and management of federal telecommunication systems.

(3) Conducts studies and evaluations concerning telecommunication research and development, the initiation, improvement, expansion, testing, operation, and use of federal telecommunication systems.

(4) Develops plans, policies, and programs which relate to international telecommunication issues, conferences, and negotiations.

(5) Provides for the coordination of the telecommuni-cation activities of the Executive Branch.

(6) Assigns frequencies to, and amends, modifies, and revokes frequency authorizations for radio stations belonging to and operated by the United States.

(7) Makes frequency allocations and establishes policies concerning spectrum allocation and use.

(8) Develops a long-range plan for management of all electromagnetic spectrum sources, including the determination of the National Table of Frequency Allocations.

(9) Reviews and coordinates research into the side effects of non-ionizing electromagnetic radiation.

(10) Acquires, analyzes, synthesizes, and disseminates data and performs research in general on the description and prediction of electromagnetic wave propagation.

(11) Performs analysis, engineering, and administrative functions, including the maintenance of necessary files and data bases as necessary in the performance of assigned responsibilities for the management of the electromagnetic spectrum.

b. Frequency management within the NTIA is under the direction of the Associate Administrator, Office of Spectrum Management, which provides the staff of the Interdepartment Radio Advisory Committee (IRAC). The IRAC and the Frequency Management Advisory Council serve in an advisory capacity to the Assistant Secretary.

Under the NTIA, the IRAC aids the Secretary in discharging his radio communications and spectrum management duties. The IRAC is made up of members of the following U.S. Government departments:

(1) Agriculture

(2) Air Force

(3) Army

(4) Coast Guard

(5) Commerce

(6) Energy

(7) Federal Aviation Administration

(8) Federal Emergency Management Agency

(9) General Services Administration

(10) Health and Human Services

(11) Interior

(12) Justice

(13) National Aeronautics and Space Administration

(14) National Science Foundation

(15) Navy

(16) State

(17) Treasury

(18) U.S. Information Agency

(19) U.S. Postal Service

(20) Veterans Administration

c. Each government agency conducts technical studies to determine its specific requirements for use of the spectrum. These requirements are analyzed in terms of policies and regulations and are coordinated with other agencies. Finally, they are presented to the IRAC for approval. The IRAC must then:

(1) Assure compliance with regulations.

(2) Assign frequencies to U.S. Government radio stations.

(3) Develop and execute policies, programs, and procedures.

(4) Develop technical criteria pertaining to the allocation and use of the spectrum.

(5) Print and distribute an updated list of frequency assignments to government radio stations.

d. The IRAC permanent and ad hoc working groups resolve national policy, planning, allocation, assignment, and notification issues. Permanent subcommittees include Technical, System Review, Frequency Assignment, and International Notification.

208. DEPARTMENT OF DEFENSE REGULATION

209. GENERAL

The DoD operates two major systems that have an impact on the electromagnetic frequency spectrum. The National Military Command System (NMCS), managed by the JCS Director of Operations, J3, provides command systems for the control of military forces by the National Command Authorities. The National Communications System (NCS), authorized by Presidential Memorandum in 1963, provides necessary communications for the U.S. Government under all conditions, ranging from a normal situation to nuclear war. The NCS is managed by the Director of the Defense Information Systems Agency (DISA) under the guidance of the Principal Deputy Assistant Secretary of Defense for Communications, Command and Control, and Intelligence (C^3I). Management of the NCS and NMCS involves the design and development of operational plans, requests for assignment of radio frequencies, and the monitoring of their use.

210. JOINT CHIEFS OF STAFF (JCS)

a. The JCS establishes policy and provides guidance on joint and interservice military frequency engineering and management matters. The guidance is specifically provided to commanders of Unified and Specified Commands and to the Director of the DISA. The guidance is based on the concept of extensive sharing since there are no exclusive radio frequencies. This sharing must take place between U.S. Government, U.S. non-government, and international agencies.

b. Basic JCS policy on joint management of the spectrum is that commanders control the use of all frequencies assigned to users within their commands. Basic policy on interservice military spectrum matters is that the service providing the support uses its own or DoD-assigned frequencies.

c. Specific JCS guidance has been developed to govern the use of the spectrum. That guidance to unified and specified commands is as follows:

(1) Planning for use of the spectrum must be done early enough to allow time for coordination and processing the require-ment before its intended use.

(2) DoD components are encouraged to use the frequency engineering and analysis capabilities of the Electromagnetic Compatibility Analysis Center (ECAC) (see Annex B).

(3) DoD components shall participate in the Frequency Resource Record System (FRRS) (see Annex B).

(4) Components must advise the assigning authority when the frequency assignment is no longer

required.

(5) Commanders will forward requirements to the United States Military Communications-Electronics Board (USMCEB) for:

(a) Intercommand frequencies where interference to U.S. national or registered international assignments may occur.

(b) Space frequencies except in-theater tactical space.

(c) Intercommand requirements.

(6) Commanders will assign frequencies for their own intercommand use as long as:

(a) National or international protection is not required.

(b) NTIA and FCC purview is not involved.

(c) The host government agrees.

211. UNITED STATES MILITARY COMMUNICATIONS-ELECTRONICS BOARD (USMCEB)

The USMCEB develops policies and procedures for implementing the spectrum management guidance of the JCS and governs the use of the spectrum within DoD, under the authority of DoD Directive 4650.1. The Frequency Panel (FP) under the USMCEB, performs these specific tasks. The USMCEB has delineated the procedures for coordinating and assigning frequency requirements submitted for USMCEB action. The procedures are included in ACP 190 US SUPP-1() and are summarized as follows:

a. The USMCEB will:

(1) Interpret international and national policies and provide guidance to Commander-in-Chiefs (CINCs) when required.

(2) Coordinate at the national level.

(3) Assign frequencies in CINC areas within the United States and Possessions (US&P).

(4) Assign frequencies for space systems (except in-theater tactical), down-range missile tests, Mystic Star/White House Communications Agency (WHCA), Worldwide Airborne Command Post (WWABNCP), MARS, GIANT TALK, and netted and worldwide aeronautical off-route systems.

(5) Conduct a formal review of all the above FRRS assignments at least every five years.

b. The CINCs will:

(1) Assign permanently fixed location sounder frequencies (notify USMCEB of these assignments).

(2) Make temporary assignments outside the US&P (with host government approval) pending assignment by USMCEB.

(3) Assign temporary (up to 90 days) tactical and exercise frequencies within the US&P.

(4) Reassign USMCEB assignments when urgency of military requirements or safety of life or property dictates.

(5) Assign temporary space system frequencies outside US&P pending formal assignment by the USMCEB.

(6) Conduct a formal review of all outside US&P (OUS&P) FRRS assignments on a periodic basis to maintain an up-to-date centralized frequency assignment database.

c. The Military Departments (MILDEPs) or designated agencies will:

(1) Interpret international, national and USMCEB policies and provide guidance to subordinate

organizations not located in a CINC's area of responsibility.

(2) Coordinate at the national level.

(3) Assign frequencies in the USA areas that are not under the control of a CINC and not included in paragraph 211. a. (4) above.

(4) Conduct a formal review of all assignments at least every five years.

212. MILITARY DEPARTMENT AND DoD AGENCY FREQUENCY MANAGEMENT

a. The US Navy uses an area frequency management concept where the US&P is divided into areas for which the responsibility has been designated Navy Area Frequency Coordinators or Commands. The details of Navy frequency management are contained in Chapter 3 and Annexes to NTP-6.

b. The US Air Force manages the spectrum through a functional concept of operation via major air command channels.

c. The Army uses area frequency management concept except for the US Army Corps of Engineers which manage the spectrum through command channels.

d. The National Security Agency (NSA) manages the spectrum through command channels.

e. The DISA coordinates frequency assignments and maintains frequency records for the Defense Communications System (DCS).

213. UNIFIED COMMAND FREQUENCY MANAGEMENT

a. CINCLANT, USCINCEUR, USCINCCENT, USCINCSOUTH manage the spectrum through command channels.

b. USCINCPAC, because of geographical

considerations, uses a combined area and command channels concept of frequency manage-ment.

c. Other Unified and Specified Commands which do not have designated areas of responsibilities manage the spectrum through command channels and obtain spectrum support as designated in Chapter 2, ACP-190 US SUPP-1( ).

214. INSTALLATION FREQUENCY MANAGEMENT

One aspect of frequency management that is common to all DoD organizations is that the commander of an installation (base, post, camp, fort, station, or activity) is responsible for management of the spectrum on the installation. At the DoD level, frequency management organizations have agreed that any organization having a requirement for frequency support on an installation will coordinate that requirement with the installation commander or his designated installation frequency manager. For example, if a Marine Corps unit plans to conduct training at Ft. Bragg, NC, frequency support should be coordinated with the installation frequency manager. This could save time in some cases because the installation frequency manager may have a frequency assignment resource available for use. In other instances, the frequency support may have to be provided by NAVEMSCEN after national-level coordination is completed. The details of Navy and Marine Corps installation spectrum management responsibilities are contained in Chapter 3.

215. DoD AREA FREQUENCY COORDINATOR (AFC)

The MCEB established the DoD AFC System for national and service test and training ranges to ensure compatible operation of C-E systems at those ranges. Each DoD AFC is responsible for promoting frequency coordination within and adjacent to its designated geographical area. Military frequency usage within the DoD AFC area of responsibility must be coordinated with the responsible

DoD AFC before activation. See Chapter 3 for detailed instructions concerning Navy-sponsored DoD AFC offices.

216. DoD ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER

a. The ECAC has been tasked by the JCS to develop and maintain a FRRS. This system includes maintenance of the FRRS central data base at ECAC and providing support to DoD activities. The DoD frequency managers recognized the need to improve the capability to integrate, retrieve, and exchange large amounts of frequency-related information. The FRRS has been developed to satisfy this need. The FRRS will assist military spectrum managers in making decisions concerning frequency assignments as well as all phases of long-term frequency allocation planning. The FRRS is designed for the user--the military spectrum manager at all echelons of command.

b. The FRRS can provide a wide range of assistance to military frequency users. Specifically, the FRRS was developed to meet these design objectives:

(1) Accept and preserve all military frequency management data.

(2) Readily provide the users of the FRRS with easy access to the management data.

(3) Provide methodologies and algorithms for analyses, such as propagation and interference predictions.

(4) Satisfy the known requirements of all DoD frequency managers.

c. The FRRS is not a substitute for military frequency managers, but rather a tool to assist in the performance of the important function of spectrum management. The FRRS will process, store, and provide outputs of the frequency information needed in spectrum management and engineering, thereby relieving the frequency manager of the tedious and time-consuming research effort. The information included in the database is relevant to day-to-day frequency assignment actions as well as to spectrum allocation planning.

d. DON frequency assignment transactions are forwarded via magnetic tape or the Defense Data Network (DDN) to ECAC in Standard Frequency Action Format (SFAF). The FRRS central database resides on permanently assigned, on-line magnetic disk storage devices. The FRRS central database consists of a single master file with records flagged to identify the cognizant service or CINC. The FRRS is divided into a temporary (TEMP) area and a master (MASTER) area. The TEMP is used as a holding area wherein new records are created and existing records are modified or flagged for deletion. The MASTER contains only those records that have been processed through the TEMP. TEMP records are not usually included in data output; however, TEMP statistics are provided as required. The FRRS file is updated on a scheduled basis with data provided by the MILDEPs, agencies, CINCs, and DoD AFCs. The FRRS data will, therefore, be as accurate as the data input by the participating commands and agencies. ECAC supports the DoD by forwarding US&P frequency proposals to NTIA for national-level approval.

e. Almost unlimited flexibility in the selection of data outputs and output format has been included in the FRRS system. The details of ECAC EMC services and FRRS support are contained in Annex B.

CHAPTER 3

DEPARTMENT OF THE NAVY REGULATION

301. GENERAL

a. All U.S. Navy and Marine Corps commands and activities involved in the development, procurement, and use of communications electronics equipment have responsibilities in the management of the electromagnetic spectrum. At the heart of the spectrum management process is the need for establishing policy, developing standards, developing procedures, establishing coordination channels, and providing training. These broad actions are carried out through planning and coordination for spectrum allocating, assigning, scheduling, using, protecting, recording, reviewing, and reporting. The paragraphs below describe the organizational responsibilities for the spectrum management process within the DON.

b. The organizations involved in spectrum management include sponsors, managers, developers, users, and coordinators. Sponsors are those organizations that establish policy, provide funding, and give overall direction to ensure the effectiveness of the spectrum management program. Sponsors include the following organizations:

Command and Control (OP-094)
Naval Computer and Telecommunication Command
Deputy Chief of Naval Operations (Submarine Warfare) (OP-02)
Deputy Chief of Naval Operations (Surface Warfare) (OP-03)
Deputy Chief of Naval Operations (Air Warfare) (OP-05)
Deputy Chief of Naval Operations (Plans, Policy, and Operations) (OP-06)
Office of Naval Warfare (OP-095)
Commandant of the U.S. Marine Corps

c. Developers provide the required communications electronics systems used to accomplish the Navy's mission. These tasks are basic research, advanced and engineering development, production, and procurement. The major developers are:

Naval Air Warfare Center
Naval Command and Control and Ocean Surveillance Center
Naval Personnel R&D Center
Naval Weapons Center
Naval Coastal Systems Center
Naval Surface Weapons Center
David W. Taylor Ship Research and Development Center
Naval Underwater Systems Center
Navy Maintenance Support Office
Navy Maintenance and Supply Systems Office
ASW Systems Project Office
Navy Astronautics Group
Naval Ordnance Test Unit
Polaris Missile Facility
Naval Plant Representative Office
Strategic Weapons Facility
Naval Submarine Support Base
Space and Naval Warfare Systems Command
Naval Supply Systems Command
Naval Air Systems Command
Naval Facilities Engineering Command
Naval Sea Systems Command
Chief of Naval Research

d. The users install and operate the systems in the accomplishment of their individual missions. Users are:

CINCLANTFLT
CINCPACFLT
CINCUSNAVEUR
CNET
COMNAVRESFOR
NAVSECGRU
NAVCOMTELCOM
NAVOCEANCOM
NAVINTCOM
NAVLEGSVCCOM
NAVCIVPERSCEN

NAVDATACEN
CNO SHORE ACTIVITIES
USMC SHORE ACTIVITIES
CNR SHORE ACTIVITIES
CI SHORE ACTIVITIES

e. The coordinators operate on a regional and local basis and resolve frequency management and coordination issues within their respective geographic regions. The coordinators are:

JFMOLANT
NCTAMS LANT
CINCUSNAVEUR
CINCLANTFLT
CINCPACFLT
NCTAMS EASTPAC
NAVCOMMSTA PUGET SOUND
AFC WESTERN US
AFC MIDDLE ATLANTIC
JFMO GUAM
NCTAMS WESTPAC
NCTAMS MED
NAVCOMSTA SAN DIEGO
NTCC OAKLAND
INSTALLATION COMMANDERS

f. Authority for the use of radio frequencies by USN and USMC activities within the United States and Possessions (US&P) is obtained from the Administrator, NTIA, through the Interdepartment Radio Advisory Committee (IRAC) in accordance with the provisions of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management. This manual is applicable to naval organizations for spectrum use within the US&P. Distribution of the NTIA Manual within the DON is limited to the Fleet Commanders in Chief and other major frequency coordination authorities. Authority to use a radio frequency within the US&P by Navy and Marine Corps Forces or activities is made through a specific assignment normally made by the Director, NAVEMSCEN, to the appropriate activity.

g. Authority for use of radio frequencies by USN and USMC activities within the area of responsibility of unified or specified commanders is requested via the commander of the appropriate Navy component. The unified or specified commanders obtain authority from the Frequency Panel of the United States Military Communications-Electronics Board (FP USMCEB) Washington, DC, acting on behalf of the JCS. Such assignments are normally made by the FP to the theater commander.

h. The U.S. Military Departments have been authorized to use certain radio frequency bands for tactical and training operations on a non-interference basis with established radio services. The authority for such use is specified in the NTIA Manual and by unified and specified commanders. Procedures for coordination and use are in Annexes D, E, and F.

i. U.S. Military units have a standing authorization for certain bands to be used for active electronic countermeasures (ECM) operations in the United States and Canada, although individual operations must be specially coordinated. The coordination procedures are contained in OPNAVINST 3430.9( ).

302. CNO SPONSORS

The Chief of Naval Operations (CNO) provides overall guidance and direction to the DON. This means that the office of the CNO determines the activities naval organizations will perform and publishes these determinations in the form of policy documents. This work is performed by the Director, Naval Communications Division. Spectrum management has two main functions: allocation and assignment. Activities of the Chief of Naval Operations revolve around the allocation function with technical assistance from NAVEMSCEN. The assignment function has been delegated to NAVCOMTELCOM. Assignments are discussed below. In addition to establishing and publishing policy, CNO:

a. Establishes overall spectrum management and electromagnetic compatibility policy and guidance for DON.

b. Provides fiscal management for spectrum management and electromagnetic programs in the DON Planning, Programming, and Budgeting System.

c. Represents the DON at DoD, allied, national, and international spectrum management forums.

d. Coordinates DON spectrum resource requirements and develops plans to acquire necessary and sufficient resources to satisfy DON's needs.

e. Coordinates DON spectrum resources with departmental, national, and international authorities and acquires these resources.

f. Collaborates with appropriate offices of other government agencies to establish spectrum management policies.

g. Participates in the preparatory work for, and when designated, represents the United States at international spectrum management conferences.

h. Exercises overall responsibility for the management, direction, and control of the DON Spectrum Management and Electromagnetic Compatibility Programs.

i. Authorizes frequency allocation applications ensuring conformance, compliance, and compatibility with departmental, national, and international rules, regulations, and procedures.

j. Grants waiver requests over system and equipment developments or procurements not meeting technical standards when properly justified.

k. Participates in DoD's established databases concerning system parameters (Equipment Characteristics File) and operations (FRRS), which are maintained by the ECAC.

303. MANAGERS

a. The COMNAVCOMTELCOM advises and assists the CNO in support of the frequency allocation process and the DON Electromagnetic Compatibility Program and on the procurement, coordination, registration, assignment, and protection of radio frequencies for test and operational use of telecommunication equipment and systems of the DON. The Special Assistant for Frequency Management (SAFM) of COMNAVCOMTELCOM, who is assigned additional duty as Director, NAVEMSCEN, discharges the above responsibilities.

b. In the process of coordinating the formulation and implementation of procedures to support worldwide DON interest in electromagnetic spectrum matters, the Director and staff of NAVEMSCEN perform the following functions:

(1) Exercises centralized management and control over the acquisition, allocation, assignment, notification, and projection of DON spectrum resources.

(2) Participates in DON, DoD, allied, national, and international spectrum management policy, coordination, and guidance development conferences.

(3) Represents the DON, DoD, allied, national, and international spectrum management forums.

(4) Coordinates DON spectrum resources with departmental, national, and international authorities and acquires these resources.

(5) Collaborates with appropriate offices of other Government agencies to formulate departmental, national, and international spectrum management policies, standards, and procedures.

(6) Participates in the preparatory work for, and when designated, represents the United States at, international spectrum management conferences.

(7) Authorizes frequency assignment applications ensuring conformance, compliance, and compatibility with departmental, national, and international rules, regulations, and procedures.

(8) Develops technical standards, propagation analyses, and spectrum plans and projects.

(9) Processes plans, allocation, assignment, propagation, and interference transactions for DON telecommunication systems, equipments, and operations.

(10) Provides guidance, training, and procedures for DON spectrum management.

c. NAVEMSCEN personnel may be contacted for assistance by calling the appropriate individual on the following telephone numbers (DSN 288-0698, commercial (202) 433-0698).

304. DEVELOPERS

The Systems Commands provide the research, development, and procurement of naval material. System Commands ensure that development organizations comply with the naval policy that states no development of material requiring use of the electromagnetic spectrum shall be undertaken unless an action has been initiated to ensure spectrum supportability. This does not include ordnance fuses. Organizations developing ordnance fuses are responsible for their own EMC and for the incorporation of adequate interference rejection techniques. Specifically, Systems Commands:

a. Manage and control telecommunication systems and equipment development and procurement.

b. Make recommendations on frequency allocation requests submitted by field activities and submit applications.

c. Make recommendations on requests for frequency assignments submitted by various test laboratories.

d. Supervise the scheduling and use of frequencies that have been assigned in support of research and development.

e. Resolve any interference problems that arise during the use of frequencies assigned in support of research and development.

f. Report all unresolved frequency interference problems to higher authority.

g. Participate in developing technical standards.

305. INSTALLATIONS

Within the DON, Commanders of Navy or Marine Corps installations are responsible for all electromagnetic radiations emanating from the installation. The installation commander will designate a single point of contact (installation frequency manager) for all frequency management matters for the installation. (See Figure 3-1). Except as specified by higher authority or the installation commander, the installation frequency manager will:

a. Ensure that only assigned radio frequencies are used by installation and tenant activities, and that frequency assignments and records are kept current for all radiating devices on the installation. In the name of the installation commander, the installation frequency manager has authority to direct any activity to cease or modify operation on a specific frequency or to change frequencies, should the need arise in order to insure compatible operations.

b. Provide installation and tenant activities with applicable radio frequency assignment authorization information. This is normally a copy of a Naval message or computer product from the installation frequency managers computer database.

c. Assist installation and tenant units with frequency actions and requirements.

d. Coordinate requirements for any proposed frequency actions originating at the installations as directed by the cognizant frequency management office.

e. Submit frequency actions through the

appropriate frequency management channels.

f. Assist users in understanding the technical parameters of their assigned frequencies.

g. Resolve interference problems at the local level if possible. Otherwise, report problems to the appropriate higher level frequency management office.

h. Ensure that directives concerning frequency management are available, current, and being followed. (OPNAVINST 2400.20E, NAVTELCOMINST 2400.1, (MCO 2400.2 from Marine Corps organizations), NTP-6, any local DON area frequency management directives.)

i. Ensure that host-tenant support agreements or Base Operating System (BOS) contracts between the installation and tenant activities include a requirement to coordinate all frequency related actions with the installation frequency manager.

j. Ensure that emitting C-E equipment considered for local procurement have an approved frequency allocation.

k. Establish a frequency management education program. The purpose of the program is to inform the appropriate personnel of the availability of frequency management guidance and need for coordination prior to the development, production, testing, procurement, acquisition, contract obligation, or operation of equipment designed to radiate or receive electromagnetic energy.

l. Maintain a point-of-contact list for frequency users on the installation.

306. <u>USERS</u>

Within the DON, the primary users of the electromagnetic spectrum are the operating forces of the Navy and Marine Corps and naval shore activities. Shore activities include installation and tenant organizations.

ABC/def
2400
Ser 000/92
30 Feb 92

From: Commanding Officer
To: RMC Abel Baker, USN, 123-45-6789

Subj: ASSIGNMENT OF ADDITIONAL DUTY

Ref: (a) OPNAVINST 2400.20E

1. In accordance with paragraph 6.b.(7)(a) of reference (a), you are hereby designated as Frequency Manager for this installation.

2. You are directed to become familiar with all duties and responsibilities of an installation frequency manager as outlined in the above reference.

I.M. BOSS

Copy to:
COMMO
DON AREA FREQUENCY COORDINATOR

Figure 3-1. Sample letter Designating an Installation Frequency Manager

This manual relates especially to shore activities. Users operating electronic equipment in the accomplishment of their assigned missions have certain spectrum management responsibilities to ensure effective, interference-free operation.

307. DoD AREA FREQUENCY COORDINATOR (AFC)

a. DoD AFCs perform frequency coordination as a service, which is not to be construed as command and control of the frequency resource. Command and control of the frequency resource is the range or area commander responsibility.

(1) There are two DON-sponsored DoD AFCs:

(a) The Western Area AFC is located at Pt. Mugu, CA.

(b) The AFC Puerto Rico is located at Roosevelt Roads, PR.

(2) The complete list of DoD AFCs and their area of responsibility is at Table 3-1.

OFFICE	AREA
Western Area Frequency Coordinator Pt. Mugu, CA 93042 Telephone: 805-989-7983 or 7981 Autovon: 351-7983 or 7981	California south of 37 30' N, including all off-shore islands.
Area Frequency Coordinator Nellis AFB, Nevada 89191 Telephone: 702-643-3608 Autovon: 682-3608	Nevada; Utah west of 111 W; Idaho south of 44 N.
Area Frequency Coordinator State of Arizona Ft. Huachuca, Arizona 85613-5000	Arizona.

OFFICE	AREA
Telephone : 602-538-6423 Autovon: 879-6423	
Area Frequency Coordinator White Sands Missile Range, New Mexico 88002-5526 Telephone: 505-678-5417 Autovon: 258-3702 FTS: 898-5017	Colorado west of 108 W; New Mexico; Texas west of 104 W; Utah east of 111 W.
OFFICE	AREA
Gulf Area Frequency Coordinator Eglin AFB, Florida 32542 Telephone: 904-882-4416 Autovon: 872-4416	Alabama south of 33 30' N; Florida west of 83 W; Georgia west of 83 W, south of 33 30' N; Louisiana east of 90 W; Mississippi east of 90 W, south of 33 30' N.
Eastern Area Frequency Coordinator Patrick AFB, Florida 32925 Telephone: 305-494-5366 Autovon: 854-5366	Florida east of 83 W; Georgia east of 83 W, south of 31 30' N.
Area Frequency Coordinator Puerto Rico Box 3023 ATTN: Code 022 FPO Miami, FL 34051-9000 Telephone: 809-865-2000; ext. 5223 809-865-7245; ext. 5227 Autovon: 831-5223	Puerto Rico, 322 kilometer (200 mile) radius of Roosevelt Roads.

TABLE 3-1. DoD AFCs

b. The primary functions of DoD AFCs are to:

(1) Review and evaluate all frequency assignment requests proposed for use within the assigned area.

(2) Provide technical comments concerning the probability of harmful interference that might be caused or encountered during use of the proposed frequency.

(3) Arrange for time sharing and technical adjustments to eliminate interference.

(4) Coordinate groups or bands of frequencies for test range operations.

(5) Interface with non-military activities in the area to resolve any interference problems that arise.

(6) Assist the MCEB in the implementation of the EMC program.

(7) Interface with other AFCs to resolve interference problems.

(8) Coordinate on five-year review of frequency assignment records.

(9) Forward reports.

308. NAVY AREA FREQUENCY COORDINATORS (AFC)

The Navy uses the Area Frequency Coordination System to ensure that all use of the spectrum is managed by a central office within a particular area. Staff at this level may be school trained and may perform frequency management activities on a full time basis. Table 3-2 lists the Navy area frequency management offices and their areas of responsibility. In some cases, sub-area frequency management offices have been assigned to assist in the frequency management process. Installation and user organizations will normally interface with the lowest level frequency management office responsible for the area in which the assignment is located.

OFFICE	AREA
Joint Frequency Management and Spectrum Engineering Office Atlantic (JFMO LANT)	States of MN, IA, MO, KS, OK, TX, and CONUS areas east of those states. All Atlantic states.
Mid Atlantic AFC (MIDAFC)	The area south of 410000N; east of a line joining 410000N 0753000W, 3330N08300W, 313000N0830000W and north of 313000N for frequency bands 1435-1535 MHz and 2310-2390 MHz.
AFC Puerto Rico	322 kilometer (200 mile) radius of Roosevelt Roads, PR (Atlantic Fleet Weapons Test Facility, AFWTF).
NCTAMS Eastern Pacific (NCEP)	AK, HI, Eastern Pacific Ocean area and the Naval Communication Stations of San Diego, Puget Sound, Stockton, and Adak.
NCTAMS Western Pacific (NCWP)	Guam, Western Pacific Ocean area, Indian Ocean area, and Naval communication stations of H.E. Holt, Diego Garcia, Japan, and Philippines.
Navy Frequency Coordinator Western US (NFCWUS)	CONUS states west of MN, IA, MO, KS, OK, TX.
Naval Frequency Coordinator Bangor (NFCBAN)	WA, ID, MT, ND, SD, NE, WY, OR.

Table 3-2. DON Area Frequency Management Offices

OFFICE	AREA
Naval Frequency Coordinator Oakland (NFCOAK)	CO, UT, NV, (North of 373000N) and CA, Oakland (North of 373000N).
Naval Frequency Coordinator San Diego (NFCSD)	NM, AZ, CA (South of 373000N) and NV (South of 373000N).

Table 3-2. DON Area Frequency Mgt. Offices, Continued

309. NAVY AFC FUNCTIONS

The primary functions of the Navy AFCs are to:

a. Review and evaluate all frequency assignment requests proposed for use within the assigned area. These requests come from installation frequency managers and user activities.

b. Coordinate with other frequency management offices (FAA, FCC, DoD AFCs, etc.) as directed by higher authority.

c. Provide technical comments concerning the probability of harmful interference that might be caused or encountered during use of the proposed frequency.

d. Interface with non-military activities as necessary to resolve any interference problems that arise.

e. Provide assistance to installation frequency managers and organizations needing help preparing frequency assignment proposal, filling out DD Form 1494, or needing help conducting FRRS record reviews.

310. DON SPECTRUM MANAGEMENT PROCEDURES

Due to high demand for use of electronic radiating equipment, the coordination of the use of the spectrum is a complex task. Diligence and timeliness are required at all levels. The following procedures are general in nature and local directives may contain additional guidance.

a. When an organization or activity desires to purchase an item of equipment to meet an operational requirement, it must contact the installation frequency manager or DON area AFC who, in turn, will determine if:

(1) The item meets established exemption criteria and an equipment allocation is not required, or

(2) An allocation is required. If so, does an equipment allocation (JF-12 document) exist for the desired item?

The DON AFC or NAVEMSCEN can assist the installation frequency manager or activity in determining the allocation status of a particular item of equipment. Annex C contains the detailed instructions for completing an equipment allocation request.

b. When an organization already has equipment and desires to operate it at a new location, modify or change the operating technical parameters at the current location or cease operation, a frequency assignment proposal must be submitted in the SFAF through appropriate channels to the approval authority, normally NAVEMSCEN or a Unified Commander. The first step is to complete the proposal filling in all SFAF items for which data is available. Particular attention should be given to data accuracy as errors increase processing time or may cause the assignment request to be rejected. If the assignment is located on a DoD installation, coordination with the installation frequency manager is required. That coordination will be reflected by entries in SFAF items 206 and 801. Depending upon local procedures, the frequency assignment proposal may be sent to the installation frequency manager for forwarding to the cognizant DON AFC or direct to the DON AFC with an info copy to the installation frequency manager. The detailed procedures for completing a frequency assignment to turn on and operate a piece of radiating equipment is at Annex D.

c. The DON AFC checks the request against its database of previously coordinated assignments. In CONUS areas, the database includes all frequencies assigned to military activities and their respective contractors and to those non-military government and non-government assignments that are being shared with test ranges.

(1) The DON AFC reviews and evaluates the assignment request to:

(a) Determine compatibility with other military assignments.

(b) Determine any technical factors that need to be considered.

(2) The DON AFC provides technical comments and recommendations concerning the probability of harmful interference to the requesting Naval activity.

(3) In CONUS areas, the DON AFC arranges for time sharing, when required, and technical adjustments to prevent harmful interference between activities. This requires negotiation of mutual agreement among competing activities. When mutual agreement cannot be obtained, the DON AFC documents the case and forwards it to NAVEMSCEN for resolution. If the area is under the jurisdiction of a Unified Area Commander, such as CINCLANT or CINCPAC, and includes test ranges or down-range missile launch complexes and instrumentation sites, the conflicts are forwarded to the Unified Area Commander for resolution. Problems not resolved by the Unified Area Commander are forwarded to the USMCEB for resolution by the Joint Frequency Panel.

(4) The DON AFC coordinates with other AFCs when the potential for harmful interference extends into their area.

(5) The DON AFC normally completes its review of the frequency assignment action within the goal of 10 working days and forwards the request to the next highest level.

d. The DON AFC provides information on all assignments to the DoD AFC for coordination.

(1) The DoD AFC considers all non-government operations in the area and identifies any potential for harmful interference. If the potential exists, every attempt will be made to resolve it at the local level. Should these attempts fail, the problem will be forwarded to the Unified Commander or NAVEMSCEN for resolution.

(2) When bands of frequencies have been previously assigned for DoD range operations, the AFC selects specific frequencies for the range operation. If the range operation is within the area of a Unified Command, the assignment will be coordinated with that organization.

(3) DoD AFC coordination is reflected by an entry in SFAF items 209 and 801 of the proposal frequency assignment. When DoD AFC coordination is completed, the proposal is forwarded through frequency management channels to NAVEMSCEN or the Unified Command.

e. NAVEMSCEN/FP (Navy) coordinates and approves US&P assignments at the national level and notifies the user that the frequency assignment is available for use.

f. The Unified Command coordinates and approves OUS&P frequency assignments not under the purview of the FP as defined in Chapter 2 of ACP-190 US SUPP-1( ) and notifies the user that the frequency assignment is available for use. Host nation coordination varies and typically takes 90 - 120 days and longer if there are any coordination complications/problems.

ANNEX A

SPECTRUM MANAGEMENT DEFINITIONS

A101. SPECIAL TERMS

The definitions in this Annex were compiled from the following sources:

a. ITU Radio Regulations.

b. NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management.

c. ACP 167(F), Glossary of Communications-Electronics Terms.

d. NAVEMSCEN reports and records.

ADAPTOR, HOMING: A device which, when used with an aircraft radio receiver, produces aural and/or visual signals which indicate the direction of a transmitting radio station with respect to the heading of the aircraft.

ADAPTOR, PANORAMIC: An attachment designed to operate with a search receiver to provide a visual presentation on an oscilloscope screen of a band of frequencies extending above and below the center frequency to which the search receiver is tuned.

AERIAL: See Antenna.

ALLOCATION: Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more (terrestrial or space) radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.

ANOMALOUS PROPAGATION: The transmission of electromagnetic radiation along other than the normally expected path, usually tending to follow the earth's curvatures, because of refractive effects such as ducting, unusual reflections, or unusual scattering of energy from discontinuities in the path.

ANTENNA: A device used to radiate or collect radio waves.

ANTENNA ARRAY: Antenna elements assembled in such a manner that the resulting radiation is concentrated in one or more directions.

ASSIGNED FREQUENCY BAND: The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum doppler shift that may occur in relation to any point of the earth's surface.

ASSIGNMENT: Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.

AUDIO FREQUENCY: A frequency which can be detected as a sound by the human ear. The range of audio frequencies extends from approximately 20 to 20,000 hertz.

AUTOMATIC FREQUENCY CONTROL (AFC): A circuit or device which maintains a receiver or transmitter on a desired frequency.

AUTOMATIC SEARCH JAMMER (Search Lock Jammer): A system comprising a search receiver and a jamming transmitter which first searches for signals having specific characteristics and then automatically jams them.

AZIMUTH:

(1) A direction expressed as a horizontal

angle usually in degrees or mils and measured clockwise from north. Thus, azimuth will be true azimuth, grid azimuth, or magnetic azimuth, depending upon which north is used.

(2) The angle at the zenith between the observer's celestial meridian and the vertical circle through a heavenly body.

BANDWIDTH: See Necessary Bandwidth and Occupied Bandwidth.

BAUD: The unit of modulation rate. It corresponds to a rate of one unit interval per second. Example: If the duration of the unit interval is 20 milliseconds, the modulation rate is 50 bauds.

BEACON: A light or electronic source which emits a distinctive or characteristic signal used for the determination of bearings, courses, or location.

BEACON, RADAR: A radionavigation transponder which transmits in response to a specific received signal. A pulsed radio signal with specific characteristics whereby the bearing or range of the transponder from the interrogator may be determined, and which in some cases may also be used to identify the transponder.

BEACON, RADIO: A radio transmitter which emits a distinctive or characteristic signal used for the determination of bearings, courses, or location.

BEAM (Radio): A radio transmission concentrated into a sector narrow in either azimuth or elevation, or in both.

BEAM APPROACH BEACON SYSTEM (BABS): An air interpreted radar system to enable aircraft to make accurate runway approaches under Instrument Flight Rules conditions. It uses a special radar beacon on the ground and appropriate interrogator equipment in the aircraft.

BEAM RIDER: A missile guided by a radar or radio beam.

BEAM WIDTH: The angle between the directions, on either side of the axis, at which the intensity of the radio frequency fields drops to one-half the value it has on the axis.

CALL SIGN: Any combination of characters or pronounceable word(s) which identifies a communication facility(ies), command(s), authority(ies), activity(ies), or unit(s); used primarily for establishing and maintaining communications.

CARRIER FREQUENCY: The frequency of the carrier wave.

CARRIER, FULL: Carrier wave emitted at a power level between 0 dB and 6 dB below the peak envelope power.

CARRIER, REDUCED: Carrier wave emitted at a power level between 6 dB and 32 dB below the peak envelope power and preferably between 16 dB and 26 dB below the peak envelope power.

CARRIER, SUPPRESSED: Carrier restricted to a power level more than 32 dB below the peak envelope power and preferably 40 dB or more below the peak envelope power.

CARRIER WAVE: A wave, usually sinusoidal, which is modulated to transmit signals. The frequency of the wave is called the "carrier frequency." The carrier wave is not transmitted in some types of modulation.

C-E EQUIPMENT: Devices and systems that utilize the electromagnetic spectrum for the acquisition, processing, storage, display, analysis, protection, or transfer of information such as communication radios, radar, and navigation systems.

CHANNEL (Radio): A specific portion of the radio frequency band usually associated with a specific telecommunication function.

CHARACTERISTIC FREQUENCY: A frequency which can be easily identified and measured in a given emission. A carrier frequency may, for example, be designated as the characteristic frequency.

CHIP RATE: The rate of encoding.

CIRCUIT:

(1) Communications Terms. An electronic path between two or more points capable of providing a number of channels.

(2) Engineering Term. A number of conductors connected together for the purpose of carrying an electrical current.

COAXIAL CABLE: A transmission line consisting of one conductor, usually a small copper tube or wire, within, and insulated from another of larger diameter, usually copper tubing or copper braid. The outer conductor may or may not be grounded. Coaxial cable is sometimes called concentric line, or coaxial line.

COMMUNICATION, RADIO: The use of radio for communication purposes. It is technically described as telecommunication using radio waves, not guided, between the sender and receiver.

CONTINUOUS CARRIER: A signal wherein transmission of the carrier is continuous, not pulsed on and off. A continuous carrier signal may be amplitude, phase, or frequency modulated.

CONTERMINOUS UNITED STATES: Includes the 48 contiguous States and the District of Columbia. See also United States and United States and Possessions.

COORDINATION: The process of affecting technical liaison between using activities to minimize electromagnetic interference through cooperative use of the electromagnetic spectrum.

COORDINATION DISTANCE: Distance on a given azimuth from an earth station beyond which a terrestrial station sharing the same frequency band neither causes, nor is subject to, interfering emissions greater than a permissible level.

<u>CROSS MODULATION</u>: The modulation of the carrier of the desired signal by an undesired signal.

<u>CRYSTAL (XTAL)</u>:

(1) A slice of a substance such as quartz or tourmaline which exhibits piezoelectric characteristics. It has the property of responding markedly to a given frequency when cut to a given thickness.

(2) A detector using the asymmetrical conducting properties of certain crystal-crystal or crystal-metal contacts.

<u>CRYSTAL CONTROL</u>: Control of the frequency of an oscillator by means of a piezoelectric crystal.

<u>DIRECT SEQUENCE SPREAD SPECTRUM</u>: A signal structuring technique utilizing a digital code sequence having a chip rate much higher than the information signal bit rate. Each information bit of a digital signal is transmitted as a pseudo-random sequence of chips.

<u>DOPPLER EFFECT</u>: The phenomenon evidenced by the change in the observed frequency of a wave caused by a time rate of change in the effective length of the path of travel between the source and the point of observation.

<u>DOPPLER RADAR</u>: Any form of radar which detects radial motion of a distance object relative to a radar apparatus by means of the "Doppler Effect."

<u>DOUBLE SIDEBAND TRANSMISSION</u>: That method of communication in which the frequencies produced by the process of modulation are symmetrically spaced both above and below the carrier frequency and are all transmitted.

<u>ELECTROMAGNETIC COMPATIBILITY (EMC)</u>: EMC is the condition that prevails when telecommunication equipment is performing its individually designed function in a common electromagnetic environment without causing or

suffering unacceptable degradation due to unintentional electromagnetic interference to, or from, other equipment in the same environment.

ELECTROMAGNETIC SPECTRUM: The full range of radio frequencies from the lowest to the highest usable for radio communications, about 10,000 hertz to 3,000 billion hertz.

ELECTRONIC COUNTER-COUNTERMEASURES (ECCM): That division of electronic warfare involving actions taken to ensure friendly effective use of the electromagnetic spectrum despite the enemy's use of electronic warfare.

ELECTRONIC COUNTERMEASURES (ECM): That division of electronic warfare involving actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum. Electronic countermeasures include:

(1) Jamming.

(2) Deception.

FACSIMILE: A form of telegraphy for the transmission of fixed images, with or without half-tones, with a view to their reproduction in a permanent form.

FINAL MODULATION - (Carrier wave of radio link transmitter): Final modulation of a carrier wave is modulation applied to the transmitted carrier. A transmitter may be modulated either directly by "multiplex telephony," or by signals for pre-modulation. There are two types of final modulation: amplitude and frequency.

FIRE CONTROL RADAR: A radar for the continuous tracking of a selected target to provide accurate positional data for the purpose of directing weapons.

FORWARD SCATTER: The reflected radiation of electromagnetic energy away from the emitting source.

FREQUENCY: The number of recurrences of a periodic phenomenon in a unit of time. In specifying the electrical frequency, the unit of time is the second. For example, the frequency is 15,000 hertz (Hz). Radio frequencies are normally expressed in kilohertz (kHz) at and below 30,000 kilohertz, and in megahertz (MHz) above this frequency.

FREQUENCY ALLOTMENT PLAN: A plan which shows the frequencies to be used in particular areas, or by particular countries, without specifying the stations to which the frequencies are to be assigned.

FREQUENCY, ALTERNATIVE: A frequency or a group of frequencies which may be assigned for use on any channel, or on a particular channel, at a certain time, or for a certain purpose, to replace or supplement the frequencies normally used on that channel.

FREQUENCY, ASSIGNED: The assigned frequency is the frequency coinciding with the center of the frequency band in which the station is authorized to work. This frequency does not necessarily correspond to any frequency in an emission.

FREQUENCY ASSIGNMENT PLAN: A plan which shows the frequencies to be used by specified stations.

FREQUENCY, AUTHORIZED: A portion of the radio spectrum, the width of which is the necessary bandwidth of emission plus twice the prescribed frequency tolerance.

FREQUENCY, DISTRESS: Frequencies allotted to distress calls by international agreement.

FREQUENCY-HOPPING SPREAD SPECTRUM: A signal structuring technique employing automatic switching of the transmitted frequency. Selection of the frequency to be transmitted is typically made in a pseudo-random manner from a set of frequencies covering a band wider than the information bandwidth. The intended receiver would frequency-hop in synchronization with the code of the transmitter in order to retrieve the desired information.

FREQUENCY, LOWEST USABLE HIGH (LUF): The lowest high frequency effective, at a specified time, for ionospheric propagation of radio waves between two specified points.

FREQUENCY, MAXIMUM USABLE HIGH (MUF): The upper limit of the frequencies that can be used, at a specified time, for radio transmission between two points and involving propagation by reflection from the regular ionized layers of the ionosphere.

FREQUENCY, OPTIMUM TRAFFIC (FOT): The most effective frequency, at a specified time, for ionospheric propagation of radio waves between two specified points commonly taken as 85% of the monthly median value of MUF for the specified time and path.

FREQUENCY, PRIMARY: A frequency assigned for normal use on a particular circuit.

FREQUENCY, SECONDARY: A frequency assigned for use on a particular radio circuit when the primary frequency becomes unusable for any reason.

FREQUENCY SHARING: The common use of the same portion of the radio frequency spectrum by two or more users where a probability of interference exists.

GAIN OF AN ANTENNA: The ratio, usually expressed in decibels (dB), of the power required at the input of a loss-free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization. Depending on the choice of the reference antenna, a distinction is made between:

- Absolute or isotropic gain (G_i), when the reference antenna is an isotropic antenna isolated in space;

- Gain relative to a half-wave dipole (G_d), when the reference antenna is a half-wave dipole isolated in space whose equatorial plane contains the given direction;

• Gain relative to a short vertical antenna (G_v), when the reference antenna is a linear conductor, much shorter than one quarter of the wavelength, normal to the surface of a perfectly conducting plane which contains the given direction.

GROUND WAVE: In propagation, that portion of the transmitted radio wave that travels near the surface of the earth.

HARMFUL INTERFERENCE: Interference which endangers the functioning of a radionavigation service, or of other safety services, or seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with the Radio Regulations.

HARMONIC: An integral multiple of a fundamental frequency.

HERTZ: A unit of frequency which is equivalent to one cycle per second.

HERTZIAN WAVES: See Radio Waves.

HYBRID SPREAD SPECTRUM: A combination of frequency-hopping spread spectrum and direct sequence spread spectrum.

INCIDENTAL RADIATION DEVICE: A device that radiates radio frequency energy during the course of its operation although the device is not intentionally designed to generate radio frequency energy.

INDEPENDENT SIDEBAND TRANSMISSION (Twin Sideband): Independent sideband transmission is that method of communication in which the frequencies on the opposite sides of the carrier, produced by the process of modulation, are not related to each other but are related separately to two sets of modulating signals. The carrier frequency may be transmitted, suppressed, or partially suppressed.

INDUSTRIAL HEATING EQUIPMENT: Any apparatus which utilizes a radio frequency oscillator or any other type of radio frequency generator and transmits radio frequency energy used for, or in connection with, industrial heating operations utilized in a manufacturing or production process.

INDUSTRIAL, SCIENTIFIC, AND MEDICAL (ISM) APPLICATIONS: Operation of equipment or appliances designed to generate and use locally, radio frequency energy for industrial, scientific, medical, domestic, or similar purposes, excluding applications in the field of telecommunication.

INSTALLATION: A base, post, station, or facility for which a Navy or Marine Corps organization has overall ownership responsibility. This includes outlying facilities such as training areas, target ranges, remote communication sites, etc., over which the installation commander exercises ownership responsibility.

INTERFERENCE: The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radio communication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

INTERNATIONAL TELECOMMUNICATIONS UNION (ITU): A civil international organization established to provide standardized communications procedures and practices including frequency allocation and radio regulations on a world-wide basis.

IONOSPHERE SOUNDER: A device that transmits signals for the purpose of determining ionospheric conditions.

IONOSPHERIC SCATTER: The propagation of radio waves by scattering as a result of irregularities or discontinuities in the ionization of the ionosphere.

LAND LINES: A general term applied to metallic or fiber optic conductors used for conveyance of intelligence.

LINK: A general term used to indicate the existence of communication facilities between two points.

LORAN: A long range radionavigation position fixing system using the time difference of reception of pulse type transmissions from two or more fixed stations.

LOW-POWER COMMUNICATIONS DEVICE: A restricted radiation device, exclusive of those employing conducted or guided radio frequency techniques, used for the transmission of signs, signals (including control signals), writing, images, and sounds or intelligence of any nature by radiation of electromagnetic energy. Examples: wireless microphones, phonograph oscillators, radio-controlled garage door openers, and radio-controlled models.

MEACONING: A system of receiving beacon signals and rebroadcasting them on the same frequency to confuse navigation. The meaconing stations cause inaccurate bearings to be obtained by aircraft or ground stations.

MICROWAVE: A subclassification of the electromagnetic spectrum. Generally, it covers the wavelength region from VHF to EHF, 3 meters to .3 centimeters.

MINIMUM DISCERNIBLE SIGNAL (MDS): The lower limit of useful signal input to a radar receiver, as determined by the signal-to-noise ratio at the output.

MULTI-FUNCTION SYSTEM: A system that provides for more than one type of telecommunication with the same equipment. This system can have one or more principal functions and may have one or more secondary functions contained within the signal format or structure. The signal structure technique can be either of a conventional or spread spectrum type.

MULTIPLEX, FREQUENCY DIVISION: A multiplex system in which the available transmission frequency range is divided into narrow bands, each used for a separate channel.

NECESSARY BANDWIDTH: For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

NIGHT EFFECT: An effect mainly caused by variations in the state of polarization of reflected waves, which sometimes result in errors in direction finding bearings. The effect is most frequent at nightfall.

OCCUPIED BANDWIDTH: The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to specified percentage, B/2, of the total mean power of a given emission. Unless otherwise specified by the CCIR for the appropriate class of emission, the value of B/2 should be taken as 0.5%.

POLARIZATION: The direction of the electrical fields component of radiated energy.

POLARIZATION DIVERSITY: The use or availability of various polarizations such as horizontal, vertical, cross, circular, or elliptical, either simultaneously or singly.

POWER CARRIER: The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle under conditions of no modulations. This definition does not apply to pulse modulated emissions.

POWER, EFFECTIVE RADIATED (ERP): The power supplied to the antenna multiplied by the relative gain of the antenna.

POWER, MEAN: The power supplied to the antenna transmission line by a transmitter during normal operations averaged over a time sufficiently long, compared with the period of the lowest frequency encountered in the modulation. A time of 1/10th second during which the mean power is greatest will be selected normally.

POWER, PEAK ENVELOPE (PEP): The mean power supplied to the antenna during one radio frequency cycle at the highest crest of the modulation envelope taken under conditions of normal operation.

PRIORITY: Priority, unless specifically qualified, is the right to occupy a specific frequency for authorized uses, free of harmful interference from stations of other agencies.

PROCESSING GAIN: The ratio of the post processing signal-to-noise ratio to the received signal-to-noise ratio, usually expressed in dB.

PROTECTION: Registration of a frequency assignment with a higher authority to ensure that no other activity can claim the right to use the frequency. Safeguarding a frequency assignment from potential interference.

PULSE: A variation in the value of an electrical quantity as a function of time such that the value departs from a given datum for time interval and then returns to this datum for a much longer time interval.

PULSE, RF: A train of radio frequency oscillations whose envelope has the form of a pulse.

RADAR: A radiodetermination system based on the comparison of reference signals with radio signals reflected or transmitted from the position to be determined.

RADAR BEACON (RACON): A transmitter-receiver associated with a fixed navigation mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing, and identification information.

RADAR HORIZON: The locus of points at which the rays from a radar antenna become tangential to the earth's surface. On the open sea, this locus is horizontal, but on land it is varied according to the topographical features of the terrain.

<u>RADIO</u>: A general term applied to the use of radio waves.

<u>RADIO WAVES OR HERTZIAN WAVES</u>: Electromagnetic waves of frequencies lower than 3000 GHz, propagated in space without artificial guide.

<u>RADIOCOMMUNICATION</u>: Telecommunication by means of radio waves.

<u>RECEIVER (Radio)</u>: A device connected to an antenna or other source of radio frequency signals in order to make available in some desired form the required information content of the signals.

<u>REFERENCE FREQUENCY</u>: A frequency having a fixed and specific position with respect to the assigned frequency. The displacement of this frequency with respect to the assigned frequency has the same absolute value and sign that displacement of the characteristic frequency has with respect to the center of the frequency band occupied by that emission.

<u>SCATTER, IONOSPHERIC</u>: The propagation of radio waves by scattering as a result of irregularities or discontinuities in the ionization of the ionosphere.

<u>SCATTERING, BACK</u>: Radio wave propagation in which the directions of the incident and scattered waves, resolved along a reference direction, usually horizontal, are oppositely directed.

Note: A signal received by back scattering is often referred to as back scatter.

<u>SCATTERING, FORWARD</u>: Radio wave propagation in which the directions of the incident and scattered waves, resolved along a reference direction, usually horizontal, are similarly directed.

Note: A signal received by forward scattering is often referred to as forward scatter.

<u>SCHEDULING</u>: Subassignment of frequencies by the fleet commanders to type commanders and commanders of

task forces, task groups, and individual units for pursuit of training and operational missions.

SCINTILLATION: In electronic warfare. Instability displayed by a window echo, due to propagation conditions, to phase changes in the window elements, or to other variables.

SHORAN: An abbreviated name for a short range radionavigation system, a precision position fixing system using a pulse transmitter and receiver and two transponder beacons at fixed points.

SIDEBAND: A sideband is the frequency band, above or below the carrier, produced by the process of modulation.

SINGLE-SIDEBAND (SSB) TRANSMISSION: That system of carrier transmission in which one sideband is transmitted and the other sideband is suppressed. The carrier wave may be either transmitted or suppressed.

SONOBUOY: A sonar device used to detect submerged submarines which, when activated, relays information by radio. It may be active directional or non-directional, or it may be passive directional or non-directional.

SPECTRUM MANAGEMENT: The process of scientific evaluation, engineering, analysis, and administrative procedures that permit a variety of telecommunication operations to share the electromagnetic spectrum without causing harmful interference.

SPREAD SPECTRUM: A signal structuring technique that employs direct sequence, frequency-hopping, or a hybrid of these, which can be used for multiple access and/or multiple functions. Spread spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrowband information signal over a relatively wide band of frequencies. The receiver correlates the signals to retrieve the original information signal.

SPURIOUS EMISSION: Emission on a frequency or frequencies which is outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency products, but exclude out-of-band emissions.

STATION: A separate transmitter or receiver, or a combination of transmitters and receivers, including the accessory equipment required for carrying on a definite radio communication service.

TACAN (Tactical Air Navigation) System: A short range air navigation UHF pulse type system that can provide a pilot with distance and bearing information from a selected ground station.

TELECOMMUNICATION: Any transmission, emission, or reception of signs, signals, writings, images, and sounds, or intelligence of any nature by wire, radio, optical, or other electromagnetic systems.

TELEGRAPHY: A form of telecommunication which is concerned in any process providing transmission and reproduction, at a distance, of documentary matter such as written or printed material, fixed images, or the reproduction, at a distance, of any kind of information in such form. For the purposes of the Radio Regulation, however, unless otherwise specified therein, telegraphy shall mean a form of telecommunication for the transmission of written matter by the use of signal code.

TELEPHONY: A form of telecommunication set up for the transmission of speech or, in some cases, other sounds.

TELEVISION: A form of telecommunication for the transmission of transient images of fixed or moving objects.

TENANT UNIT or TENANT ACTIVITY: An organization which is located on or conducts training, exercises, or operations on an installation but does not exercise ownership responsibility over the installation.

TIME-GATED DIRECT SEQUENCE SPREAD SPECTRUM: Direct-sequence spread spectrum where the transmitter is on for only a short fraction of a time interval. The "on" time can be periodic or random within a time interval.

TRANSMITTER: Apparatus producing radio frequency energy for the purpose of radio communication.

ULTRASONIC EQUIPMENT: Any apparatus which generates radio frequency energy and utilizes that energy to excite or drive an electromechanical transducer for the production of sonic or ultrasonic mechanical energy for industrial, scientific, medical, or other non-communication purposes.

UNITED STATES: The term "United States" includes the 50 states and the District of Columbia. See also definitions for "Conterminous United States" and "United States and Possessions."

UNITED STATES AND POSSESSIONS: The term "United States and Possessions" includes the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, and the territories and possessions of the United States, but less the Canal Zone. See also definitions for "Conterminous United States" and "United States."

A102. SERVICES

The following definitions are quoted from the ITU Radio Regulations:

AMATEUR SERVICE: A radiocommunication service for the purpose of self-training, intercommunication, and technical investigation carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

BROADCASTING SERVICE: A radiocommunication service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions, or other types of transmissions.

FIXED SERVICE; A radiocommunication service between specified fixed points.

LAND MOBILE SERVICE: A mobile service between base stations and land mobile stations or between land mobile stations.

MARITIME MOBILE-SATELLITE SERVICE: A mobile-satellite service in which mobile earth stations are located onboard ships. Survival craft stations and emergency position indicating radio beacon stations may also participate in this service.

MARITIME MOBILE SERVICE: A mobile service between coast stations and ship stations, between ship stations, or between associated onboard communication stations. Survival craft stations and emergency position-indicating radio beacon stations may also participate in this service.

MARITIME RADIONAVIGATION-SATELLITE SERVICE: A radionavigation-satellite service in which mobile earth stations are located onboard ships.

MARITIME RADIONAVIGATION SERVICE: A radionavigation service intended for the benefit and the safe operation of ships.

METEOROLOGICAL AIDS SERVICE: A radiocommunication service used for meteorological, including hydrological, observations and exploration.

MOBILE SERVICE: A radiocommunication service between mobile and land stations or between mobile stations.

PORT OPERATIONS SERVICE: A maritime mobile service in or near a port, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the operational handling, the movement, and the safety of ships and, in emergency, to the safety of persons. Messages which are of a public correspondence nature shall be excluded from this service.

SHIP MOVEMENT SERVICE: A safety service in the maritime mobile service other than a port operations service, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the movement of ships. Messages that are of a public correspondence nature shall be excluded from this service.

STANDARD FREQUENCY AND TIME SIGNAL SERVICE: A radiocommunication service for scientific, technical, and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception.

ANNEX B

ELECTROMAGNETIC COMPATIBILITY (EMC)

B101. GENERAL

a. The DoD has an integrated Electromagnetic Compatibility Program (ECP), established by DoD Directive 3222.3. The DON participates in this program by accomplishing the following tasks:

(1) Develops standards and specifications.

(2) Develops measurement techniques and instrumentation packages and implements an effective EMC training program.

(3) Maintains an accurate data base and employs EMC analyses capabilities where appropriate.

(4) Develops and observes appropriate equipment design parameters.

(5) Develops concepts and doctrine that consider EMC.

b. The Chief of Naval Operations is the DON executive for all EMC matters, and in this role he ensures action to fulfill the above tasks.

B102. EMC POLICY

The DON has established the following policies regarding the ECP:

a. EMC considerations are mandatory throughout the DON and will be applied in the research, design, development, production, procurement, installation, and operational use of telecommunication equipment and systems and their integration into naval land, surface, subsurface, air, and aerospace systems configurations. The achievement of total system EMC in the operational environment will be emphasized.

b. In the development and improvement of naval ships, aircraft, shore stations, weapon systems, and other components, subsystems, and systems, consideration of total system mission survivability and operability in the electromagnetic environment is mandatory. This environment may be created by both friendly and hostile sources and induced either intentionally, as through electronic warfare, or unintentionally. Consideration shall extend from conceptual formulation through design, development, test, evaluation, acquisition, installation, and operation.

c. A prime objective is the attainment of "built-in" EMC during the concept and design phases of electronic/electrical systems and platforms, rather than resorting to after-the-fact remedial measures. To be effective, EMC must be a total process, continuing throughout the procurement cycle from concept formulation through engineering development and production, to installation and operation in the complete system environment.

d. The earlier in the procurement cycle that EMC requirements can be determined, the better the chance of meeting them or of making a decision whether to continue with the development of the system concerned. Accordingly, each proposed new telecommunication equipment or subsystem will be subjected to a thorough predevelopment analysis of its mutual EMC aspects with the intended future operational environment. Authority to proceed with development must be predicated on the assurance that EMC can, in fact, be achieved or, if not, duly considered and waived in favor of overriding operational necessity.

e. In satisfying requirements for EMC analysis and prediction, and in consonance with DoD Directive 3222.3, the facilities of the DoD ECAC shall be used to the maximum practical extent and shall not be unnecessarily duplicated.

B103. RESPONSIBILITIES

a. Each command, activity, project or program office, laboratory, and facility within the DON is responsible for the application enforcement of EMC requirements and for the achievement of EMC within its respective area of cognizance.

b. The Director, Command and Control, is assigned overall responsibility for providing policy guidance and management direction of DoD ECP matters within the DON, for ensuring sufficient funds are programmed, and for:

(1) Directing, coordinating, and implementing ECP objectives and requirements as they apply to the C Programs area.

(2) Achieving operational EMC by:

(a) Ensuring procedures are developed for detecting, reporting, assessing, and recommending corrective actions of operational EMC problems among electromagnetic/electric systems and aboard platforms.

(b) Ensuring an educational/training program is developed for DON personnel as appropriate in the methods and techniques for achieving EMC in the design, development, installation, maintenance, and operations of equipment/systems/platforms.

(c) Providing the Director, Antisubmarine Warfare and Ocean Surveillance, EMC factors to be considered in fleet use of electromagnetic equipment and systems to minimize the impact of electromagnetic interference (EMI) thereby enhancing fleet readiness.

(3) Maintaining liaison with and providing advice and assistance to other commands and offices in the execution of responsibilities for EMC matters assigned herein.

(4) Monitoring, in coordination with the other CNO mission and platform sponsors and the Commandant of the Marine Corps, overall ECP efforts to ensure that necessary action is being taken to achieve EMC on platforms and among telecommunication equipment and systems employed by the Navy and Marine Corps and other users of the electromagnetic spectrum.

(5) Planning, procuring, allocating, assigning, and protecting radio frequencies within the DON in a manner to obtain maximum operational EMC with all users of the electromagnetic spectrum.

(6) Establishing departmental requirements and developing required EMC tools, methods, analysis, and prediction techniques, and design guidance for the collection of spectrum signatures, electromagnetic environmental data, test and evaluation, and measurement and prediction support in furtherance of the DoD and DON ECP and objectives.

(7) Ensuring the provision, updating, and verification of the various categories of Navy and Marine Corps electromagnetic environmental information maintained in the ECAC database.

(8) Assigning analysis tasks to ECAC to investigate EMC problem aspects of planned and existing telecommunication equipment installations.

(9) Responding to requests for assistance and advising the Commandant of the Marine Corps, the Deputy CNOs and the Directors on the CNO/VCNO staff, as appropriate, on DON EMC matters. Provide known or suspected electromagnetic incompatibilities, as determined by analysis and/or environmental tests during developmental phases, among telecommunication equipment, systems, and platforms within their respective areas of cognizance, and recommend solutions thereto.

(10) Coordinating, with the cognizant mission sponsor, requests for waivers and exercising waiver control authority over EMC standards and specifications, platform design, construction, and modernization.

c. The Director, Research, Development, Test and Evaluation (RDT&E), is assigned responsibility for maintaining cognizance of and providing appropriation sponsorship and policy direction for the RDT&E aspects of EMC and for ensuring:

(1) EMC is a mandatory consideration in the RDT&E of telecommunication equipment and systems within

the DON.

(2) RDT&E requirements documentation concerned with telecommunication equipment development and acquisition reflects the importance of elimination and control of EMI.

(3) Service tests and evaluations of telecommunication equipment and systems being developed by the DON are conducted to ensure EMC testing in typical operational environments and to establish confidence in analysis and predictions performed.

(4) Appropriate membership is provided in intradepartmental and DoD work/study groups concerned with the RDT&E aspects of EMC and that development coordinators are provided for the management of RDT&E projects in EMC.

d. The Director, Antisubmarine Warfare and Ocean Surveillance, is assigned the responsibility for ensuring that EMC factors are provided to the Fleet for consideration while developing tactical concepts and doctrine for fleet employment of electromagnetic equipment and systems to minimize the impact of EMI and to enhance fleet readiness.

e. The Deputy Chiefs of Naval Operations (Submarine Warfare), (Surface Warfare), (Logistics), (Air Warfare), The Director, Antisubmarine Warfare and Ocean Surveillance, and the Director, Naval Education Training, are responsible for implementation of EMC requirements within their respective areas of responsibility, and:

(1) In coordination with the Director, Command and Control, for developing and implementing procedures for detecting, reporting, and correcting operational and technical EMC problems within their areas of jurisdiction.

(2) Ensuring that, before recommending or approving for service use telecommunication equipment developed under their sponsorship, such equipment has been authorized a frequency allocation and that analysis,

test, and evaluation indicate conclusively that mutual EMC with the operational environment can be achieved or has been duly considered and that EMC waivers, because of overriding operational needs, have been approved by the Director, Command and Control.

(3) Ensuring EMC considerations in the design, construction, and modernization of naval platforms.

f. The Commander, Space and Naval Warfare Systems, is responsible for the achievement of EMC in the material phases of design, development, procurement, installation, and operation of platforms and telecommunication equipment with the Navy. In addition, he is responsible, as specified by the Commandant of the Marine Corps, for that telecommunication equipment procured to meet Marine Corps requirements and will:

(1) Provide RDT&E support, as required, in the attainment of the objectives set forth in DoD Directive 3222.3.

(2) Develop the procedures and ensure that sufficient funds are requested for detecting, reporting, and assessing operational EMC problems along with subsequent procedures and funds for solving and correcting operational problems.

(3) Develop and maintain the measurement capability necessary to achieve EMC.

(4) Develop and improve engineering standards and criteria for EMI elimination in the design, construction, installation and operation of platforms and telecommunication equipment for aircraft, weapons (including missiles), surface, subsurface, aerospace, and shore electronic systems.

(5) As a DoD Standardization Program area assignment of the Assistant Secretary of Defense (I&L), develop and maintain a coordinated plan to provide a complete range of component, circuit, equipment, subsystem, and platform EMC standards for the DoD. Make reports yearly to the C3I ECP designee on the status of this assignment.

(6) Ensure that proposed development plans of the DON concerned with platforms and telecommunication equipment development and acquisition provide for the elimination and control of EMC.

(7) Ensure that EMC is a mandatory programming item in the development and procurement of platforms and telecommunication systems and that all new developments, upon completion of concept formulation and design, and before commencement of actual development, are subjected to a thorough EMC analysis to ensure that such equipment, when developed, will be electromagnetically compatible in their operational environments.

(8) Ensure contractual adherence to standards and specifications for EMI elimination and control.

(9) Ensure that frequency allocation applications are submitted as required, and establish safeguards to ensure that no contract is let for the development and/or procurement of telecommunication equipment without an approved frequency allocation.

(10) Establish the capability to simulate and analyze weapon (missile), aircraft, surface, subsurface, aerospace, and shore electromagnetic environments. The services of the ECAC shall be programmed and used as applicable and available.

(11) Provide for the education of the DON personnel and its contractor personnel in the prediction, detection, and elimination of EMI during platform and equipment design, development, production, installation, operation, and maintenance.

(12) Provide appropriate naval representation on joint working groups and committees involved in the RDT&E and O&M aspects of the ECP, including specifically those groups charged with the development and coordination of the measurement techniques and instrumentation, technical standards impacting on EMC accomplishment, and the test and validation plans.

g. The Commandant of the Marine Corps is responsible for attainment within the Marine Corps of the objectives of the DoD ECP and will:

(1) Specify EMC requirements for telecommunication equipment and systems as a part of the statement of military characteristics.

(2) Ensure that proposed development plans developed under the cognizance of the Marine Corps for telecommunication equipment, provide for the elimination and control of EMI.

(3) Ensure that EMC is achieved in the design, development, procurement, installation, maintenance, and operation of telecommunication equipment within the Marine Corps.

(4) Ensure that frequency allocation applications are submitted as required, and establish safeguards to ensure that no contract is let for the development and/or procurement of telecommunication equipment without an approved frequency allocation.

(5) Provide membership, as appropriate, to international, national, DoD, and DON work/study groups concerned with EMC.

h. The Chief of Naval Research will ensure compliance and coordination by activities under his command and cognizance in the attainment of EMC within the DON.

B104. GENERAL EMC IMPLEMENTATION

a. Management and engineering personnel must establish and implement a procedure for integrating EMC into the various phases of the life cycle of platforms, systems, and equipments. This approach is required to ensure early consideration of EMC as well as to provide the necessary continuity for achieving and maintaining the required EMC. The approach, in the case of a complex system, usually includes modeling, analyzing, simulating, and testing to determine emission and susceptibility characteristics and operational constraints. Final requirements are postulated by tailoring general standards to the peculiar characteristics and operational requirements of the item in its individual specification.

b. The principal phases in the life cycle of a system or platform are concept development, concept validation, full-scale engineering development, production, and deployment. Following is a description of each phase and the EMC tasks that shall be performed during each phase.

B105. CONCEPT DEVELOPMENT

a. During the concept development phase, technical and financial baselines for a development and acquisition program are established. These include definitions of required operational capability, doctrines, and specific material requirements. Critical technical and operational issues are identified for study and resolution in subsequent phases, whereas performance characteristics are established only in general terms. A Type I statement of work (SOW), request for quotation (RFQ), and Type A specification will be prepared as required. Outputs of this phase are alternate concepts, estimated operational schedules, and estimated procurement costs. Proper consideration of EMC during this phase will have a significant impact throughout the system's life cycle. For example, preliminary selection of operating frequency band, type of modulation and other technical parameters must be consistent with established international and national frequency management policies. Also, an assessment of the ability of a system to perform its function during its life cycle must include a threat analysis, using both the friendly and hostile electromagnetic environments that may be encountered. These factors must be addressed not only in performing trade-off studies and risk assessment, but also in estimating total program costs.

b. A list of EMC tasks that should be addressed during this phase of the program is provided below. On large programs, it is recommended that the program manager either consult with the EMC authority within his activity or designate an EMC task manager to support him on EMC matters throughout the program.

(1) Prepare ECP plan.

(2) Budget for EMC effort during program

(3) Establish an EMC advisory board.

(4) Determine spectrum requirements and submit request for frequency allocation (see Annex C).

(5) Define electromagnetic environment that may be encountered during life cycle.

(6) Perform an analysis to determine if proposed system or platform can operate in the anticipated electromagnetic environment.

(7) Establish initial EMC requirements for system or platform.

B106. <u>CONCEPT VALIDATION</u>

a. The primary objective of this phase is the selection of the single concept that will be carried out through full-scale development. To accomplish this, the estimates made in the concept development phase must be refined. Areas of risk must be reassessed to ensure that they have been adequately defined and can be resolved or minimized. Frequently, this phase includes the construction of prototypes to evaluate operational, technical, and environmental factors as well as to refine costs. A Type II SOW, RFQ, and Type B specification for research and development contract support will be prepared, as required.

b. EMC tasks that should be addressed where applicable during this phase of the program are as follows:

(1) Review/update the anticipated electromagnetic environment description.

(2) Refine analyses to determine if proposed

system or platform will satisfactorily operate in the latest estimated environment.

(3) Define acceptable performance criteria.

(4) Evaluate EMC standards and criteria, electromagnetic environment, and acceptable performance criteria to determine if system or platform will meet general EMC criteria.

(5) Develop tailored EMC requirements for acquisition and corresponding SOW for preparation and submission of contract data items.

(6) Submit request for developmental frequency allocation.

(7) Specify operability analyses and testing requirements for inclusion in the Test and Evaluation Master Plan.

(8) Refine cost estimate for EMC effort, including testing.

B107. FULL-SCALE DEVELOPMENT

a. The primary objective of this phase is the design and fabrication of a system or platform in accordance with specific requirements tailored to such factors as procurement, mission, and environment. The system or platform must be fully evaluated and tested to verify that the design not only meets its specification, but that the system or platform satisfactorily performs its stated missions in the operating environment. This phase must also provide the documentation, including testing and analysis reports, to enable a decision to be made as to whether to proceed to production. Approval for service use must be obtained before proceeding to production. A Type III SOW, Type B or C specification will be prepared and used for the development contract.

b. EMC tasks that should be addressed during this phase of the program are:

(1) Finalize EMC requirements and SOW for acquisition of a preproduction model. This includes the preparation and delivery of contract data items, such as EMC control plans, test plans, and test reports.

(2) Review and comment on contractor's data items.

(3) Monitor and review engineering change proposals and requests for waivers to contract EMC requirements.

(4) Develop and implement comprehensive programs to demonstrate by simulation, analysis, and test that the system or platform will perform its mission in the operational electromagnetic environment.

(5) Submit request for assignment of specific frequencies for testing.

(6) Document EMC aspects of maintenance, production, and training plans.

(7) Develop EMC specification requirements for inclusion in production contract.

(8) Develop installation criteria and guidance to preclude electromagnetic problems.

(9) Submit request for operational frequency allocation.

B108. <u>PRODUCTION</u>

a. This phase encompasses the program from approval for production to delivery and acceptance of the last item being procured. Acceptance tests will be performed to demonstrate conformance to the requirements in the production specification as well as to ensure satisfactory performance when the item is in operational use. Strict quality control methods are required to ensure that proposed changes to the configuration do not degrade the performance of the item. When acquisition is complete, responsibility to support the system or platform is turned over to the logistics manager.

b. EMC tasks that should be addressed during this phase of the program are:

(1) Review contractor's EMC test plan and report for acceptance tests.

(2) Perform special EMC acceptance tests.

(3) Finalize EMC aspects of maintenance and training plans.

(4) Develop and document frequency management/usage plan.

(5) Update EMC plan and turn it over to the logistics manager.

(6) Ensure that engineering change proposals are reviewed for EMC impact.

(7) Include EMC Condition Report in Ship Status Report of design, maintenance, and support deficiencies.

B109. <u>DEPLOYMENT</u>

a. This phase begins with the acceptance of the first operational system or platform and extends until all are phased out of the inventory. There is usually an overlap with the production phase. In-service performance must be monitored by a reliable, established feedback system to detect, report, and correct operational problems. Any modifications, engineering change proposals, or overhaul plans must be reviewed in accordance with the program and configuration control system.

b. EMC tasks that should be addressed during this period include:

(1) Implement maintenance, training, and frequency management/usage plans.

(2) Maintain configuration control during systems modifications. Engineering change proposals must be reviewed for EMC impact.

(3) Investigate and fix reported electromagnetic problems.

B110. GENERAL EMC SERVICES

The ECAC is a joint activity chartered by DoD Directive 5160.57 and administratively managed and operated by the Air Force. ECAC maintains the data bases and mathematical and computer analysis techniques for investigating DoD and interservice EMC problems. It provides DoD components with convenient and rapid access to the data bases and analysis techniques and assists in problems within and between the services. As the DoD focal point of joint analysis for the ECP, ECAC analyzes C-E equipment in being, under development, or proposed for development to determine its EMC with other types of equipment in present and future environments. ECAC can provide spectrum supportability analysis on the ability of new systems and equipment to operate in their intended environment without suffering or causing unacceptable degradation due to EMI.

B111. ECAC DATA FILES

The ECAC collects, catalogs, and stores large amounts of detailed information to form an EMC data base. The data base includes environmental, technical, and frequency assignment information about selected technical characteristics of equipment, military frequency assignments, selected terrain elevation information, and rules governing the use of the frequency spectrum worldwide. This data base is divided into the following files:

a. Tactical Data Base (TACDB). This file identifies the C-E equipment complements of mobile units (combat communications groups and TAC groups) and platforms (aircraft, ships, and jeeps) of the military services.

b. Equipment Characteristics Information (ECI). This file contains general technical performance and nominal characteristics data on approximately 20,000 specific types of equipment in both the military and nonmilitary inventory. It includes such information as transmitter power output; receiver sensitivity; transmitter and receiver modulation and bandwidth capabilities, tuning ranges, and similar items.

c. Frequency Resource Record System (FRRS). ECAC maintains military frequency assignment records for agencies within the DoD. The FRRS contains all DoD permanent frequency assignments and temporary assignments for periods longer than 90 days as reported in accordance with ACP 190 US SUPP-1( ). In addition, ECAC also maintains frequency assignment records received from the ITU, NATO, Canada, FCC, and NTIA.

d. Topographic (Terrain) Data File. The ECAC stores topographic data on magnetic tape in a grid of elevators. Most of the data comes from standard Defense Mapping Agency topographic maps, which are provided to ECAC in a format suitable for automatic processing. Most of these data are stored in 30-second (half-mile) grid spacing format. Contact ECAC/CN for more information on the contents and use of this file.

e. Spectrum Allocation and Use File (SAUF). This file contains international and national rules, regulations, and agreements governing the use of the frequency spectrum on a worldwide basis. This is a hardcopy document file of national and international tables of allocation and regulations as provided to ECAC by the MCEB and Unified Commands. Some of documents contained in the SAUF include the allocation tables and restrictive notes for the ITU, U.S. National Tables, FCC Radio Regulations, various MCEB papers, and host country allocation tables.

B112. <u>ECAC DATA SERVICES</u>

The following data output products are published by ECAC and are available upon request through ECAC/CN:

a. Selected File Summary Outputs. The ECAC can provide selected outputs from any of their automated files. These outputs are normally in the form of a computer listing; however, they may also be on magnetic tapes, floppy disks, hard disks, computer plots, microfilm, and microfiche. ECAC can handle specific requests for data from these files or can provide a recurring output, either of which can be tailored to meet requestor requirements.

b. Frequency Allocation List (FAL), U.S. Military Electronic Equipment. This is a comprehensive tabulation by frequencies of MCEB J/F 12 frequency allocation applications (DD Form 1494) for the military services' C-E equipment. It does not include countermeasures devices and test equipment. The data contained in the FAL publication include existing and planned electronic equipment for aircraft, spacecraft, and ship and shore facilities that have current frequency allocation approval of the USMCEB Frequency Panel. The list includes selected technical characteristics, such as frequency band, power, bandwidth, modulation, pulse width, and PRR for each allocation application.

c. J/F 12 Frequency Application Index (FAI). This publication lists all frequency allocation applications published in the J/F 12 series along with their current status. The FAI data content is limited to administrative items, such as J/F 12 number, application title, and application status, and does not include technical characteristics data.

d. C-E Equipment Characteristics. The ECAC can provide special equipment characteristics listings upon request. It can provide data on specific equipment, equipment in specified frequency bands, or equipment performing specific functions.

B113. <u>ECAC ANALYTICAL SERVICES</u>

The availability of a large data base at ECAC and the development of specialized analysis techniques enable ECAC to provide a unique service in studying and investigating EMC problems. ECAC primarily assists in the system-to-environment and the environment-to-system compatibility areas with some capability for intersystem analysis. (Intersystem compatibility is between several systems in a defined area, such as a radar site, a ship, and an aircraft, etc. System-to-environment compatibility involves the mutual interactions among all users of the electromagnetic spectrum over large physical areas.) ECAC performs analyses as follows:

a. Develops a list of equipment with the potential to cause interference to, or experience interference from, operating equipment as well as equipment proposed for development, acquisition, modification, or installation.

b. Gives guidance in selecting earth station locations for satellite communications systems.

c. Performs frequency studies to assist in the selection of the best frequency bands for new systems.

d. Evaluates various advanced system design parameters and their effect on operational performance in a system's intended environment and makes recommendations for improving system EMC performance.

e. Assesses radiation hazard (RADHAZ) potentials by predicting the radiated signal levels and comparing them with established safety criteria.

f. Gives guidelines for making frequency assignments to various C-E systems, as well as guidance for interference-free deployment and use.

g. Determines expected inband and out-of-band performance characteristics for planned transmitters and receivers.

h. Develops map overlays showing the areas within which aircraft cannot be detected by ground-based radar because of shielding by topographic features. This information may then be used during the site selection to optimize coverage of one or more radars.

B114. ECAC TECHNOLOGY TRANSFER PROGRAM

ECAC provides EMC related computer software to DoD organizations involved in EMC and frequency management activities. Most of these programs are free; however, some may have a nominal acquisition cost associated with their distribution. The programs currently available are:

a. Power Density Program (PDP) - Determines the power density and field strength at a given on-axis distance from the aperture of the antenna. It also calculates the on-axis distance from the transmitter beyond which the given field strength or power density is not exceeded.

b. Satellite Look Angles Program - Calculates the azimuth and elevation angles from a ground terminal to a geostationary satellite.

c. Intermodulation and Harmonic Analysis Program (IHAP) - Performs intermodulation and/or harmonic analysis on user-supplied frequency lists.

d. Geographic Package (GEOPAC) - Provides coordinate conversions between Military Grid, geographic and Universal Transverse Mercator (UTM) systems.

e. Frequency Dependent Rejection Calculation Program (FDRCAL) - Calculates the frequency-dependent rejection (FDR) of an interfering transmitter signal by the radio frequency/intermediate frequency (RF/IF) filter stages of a victim receiver. Also calculates combinations of frequency separation distances.

f. Mixed Path Model (MIXPATH) - Provides loss predictions and reliable communications distance calculations for paths over one or more earth types (propagation paths).

ANNEX C

RADIO FREQUENCY ALLOCATION TO EQUIPMENT

C101. POLICY

Department of the Navy policy as provided in OPNAVINST 2400.20E requires that no funds be obligated for the development, production or procurement of C-E equipment beyond the conceptual stage until a radio frequency allocation for that equipment has been approved by the CNO. A radio frequency allocation to an equipment is defined as the acknowledgement by the CNO that development and/or procurement of a particular C-E equipment can be supported for operation on a specific radio frequency or band of radio frequencies within the radio frequency spectrum. By coordinating a completed DD Form 1494 (Application for Equipment Frequency Allocation) through the USMCEB, national and international levels, CNO ensures that the type of service provided by the equipment matches the National and International Tables of Frequency Allocations, complies with applicable standards, and does not increase chances of EMI to other C-E equipment operating in the same electromagnetic environment (EME).

C102. DIRECTIVES/AUTHORITY

The process to request a radio frequency allocation to an equipment is a fairly complex system of review and coordination at the international, national, and DoD levels. The process is driven by a series of Government, DoD, and Navy directives. Following is a list of these directives:

a. OMB Circular A-11 - Preparation and Submission of Budget Estimates.

b. NTIA Circular 11 - Frequency Spectrum Policy Concerning the Development and/or Procurement of Communication-Electronics Systems.

c. NTIA Manual of Regulations and Procedures for

Federal Radio Frequency Management.

d. DoD Directive 3222.3 - Department of Defense Electromagnetic Compatibility Program.

e. DoD Directive 4650.1 - Management and Use of the Radio Frequency Spectrum.

f. DoD Directive 5000.1 - Defense Acquisition.

g. DoD Directive 5000.2 - Defense Acquisition Management Policies and Procedures.

h. OPNAVINST 2400.20E - Navy Management of the Radio Frequency Spectrum.

C103. GENERAL PROCEDURES

Applications for radio frequency allocation should be prepared on DD Form 1494 and should be forwarded as early as practicable through the chain of command to CNO (OP-940T). Applications are required when:

a. The organization first knows the intended use and the spectral requirements of the equipment.

b. Experimental research and development is planned for C-E equipment.

c. C-E equipment development progresses to the advanced or engineering development stage from the experimental or research stage.

d. Operational procurement of C-E equipment is required.

e. Procurement of a commercial telecommunication equipment or system for military use is being planned.

f. A change occurs in the stated conditions or operating parameters on which a previous application has been approved or is pending.

C104. ACTIONS

The command with contract management responsibility, which includes procurement, modification, and experimental development or engineering responsibility for the equipment must submit applications for new system development. The actions necessary to obtain an approved application are as follows:

Step 1. Define the Mission

The definition of the mission provides a means of deriving the telecommunication needs of the system and therefore the overall capability the system will satisfy. It serves as a meaningful basis for preparation of radio frequency requirements.

Step 2. Determine Telecommunication Requirements

The telecommunication requirements reflect the specific functions that result in a demand being placed on the radio frequency spectrum. Such functions can include, among others, communications, navigation, identification, electronic countermeasures, and command and control.

Step 3. Identify the Implications of the Telecommunication Requirements

This step involves conducting an overview of the requirements and the state of technology to assess whether certain factors would lead to the selection of radio frequency bands ideally suited for the requirement.

Step 4. Determine Tentative Radio Frequency Band(s) of Operation

Potential radio frequency bands in which the system will operate are now identified. International, national, and DoD regulations, policies, and procedures are considered when tentative radio frequency bands are selected and peacetime testing and training areas are identified.

Step 5. Electromagnetic Environment Survey

Utilizing available radio frequency listings, consider other occupants of the desired radio frequency band or bands. By examining other system parameters and intended geographical areas of operation(s), selections could be made of existing systems to fulfill the mission. Failing that, other systems that are in the same radio frequency band(s) that may cause future EMI problems have been identified.

Step 6. Radio Frequency Band Selection

Based on the results of previous steps, normally radio frequency bands are selected from those allocated in International or National Tables to the radio service appropriate for the equipment/system being developed. However, after giving due regard to protection required and possible operational restrictions, other radio frequency bands may be proposed, in which case operational, technical, and economic justification must be provided.

Step 7. Radio Frequency Allocation Application

Once the radio frequency band or bands have been identified, the developer forwards a complete application on a DD Form 1494 through channels to CNO (OP-940T).

Step 8. Obtaining Foreign Disclosure Authority

The release of technical information contained in the DD Form 1494 to foreign countries is necessary to coordinate Navy systems designed or planned to operate outside the US&P. Before releasing technical information, foreign disclosure approval must be obtained by the developing program manager through Navy disclosure channels. OPNAVINST 5510.48J, Manual for the Disclosure of Classified Military Information to Foreign Governments and International Organizations (U), provides procedures and guidance for foreign disclosure authority.

Step 9. **Intermediate Headquarters Action**

As the application makes its way through the hierarchy to CNO, it is reviewed and comments, recommendations, and specific directions are provided.

Step 10. **Review**

CNO validates the requirement and reviews the application to determine the validity of the requirement, the EMC considerations, and the technical aspects of the application. NAVEMSCEN assists with this review.

Step 11. **Coordination**

Once the technical review is completed satisfactorily, CNO validates the requirement. NAVEMSCEN then coordinates the allocation with other services through membership position on the J/F 12 Working Group of the USMCEB and, when necessary, with the NTIA through membership on the SPS of the IRAC. NAVEMSCEN supports CNO as required by OP-940T.

Step 12. **Approval**

When the CNO is satisfied that all requirements are met and coordination is complete, he will approve the application and notify the developer. The CNO exercises his waiver control authority IAW reference (f), in those cases where system developments fail to meet EMC standards.

Step 13. **Monitor and Reiteration**

The processing of radio frequency allocation applications is an iterative process. The procurement process contains four stages: conceptual, experimental, developmental, and operational. Once the initial allocation is granted and as the system proceeds through these stages, major changes are likely to occur that will have direct impact on the equipment allocation. When these changes occur, the developer must notify the CNO through channels so that the CNO can make appropriate adjustments.

C105. RADIO FREQUENCY ALLOCATION TO EQUIPMENT GENERAL REQUIREMENTS

a. Systems Requiring Allocation to Equipments

(1) Communications

(2) Radars

(3) Transmitters

(4) Receivers

(5) EW

(6) Simulators

(7) Equipment using civilian bands

(8) Off-the-shelf systems

(9) Equipment bought from foreign nations

(10) New systems in a band already used for similar systems

(11) Classified systems

(12) Modified versions of previously approved equipment

(13) Systems already used by the Army or Air Force

(14) Systems not planned for operational use

(15) Systems to be used at sea only

(16) Existing systems without allocations

(17) Leased equipment

(18) Test equipment

b. Systems Not Requiring Allocation to Equipments (A DD Form 1494 is not required.)

(1) Low-Power Equipment. Low-power equipment and devices that meet the low power requirements of reference (c) have negligible impact on the environment, and radio frequency regulation is not required in the US&P.

(2) Electronic Fuzes. ACP-190 US SUPP-1 (B) describes actions to protect electronic fuzes that activate detonation devices.

(3) Bench Test Equipment.

(4) Laser Equipment.

(5) Nontactical Radio Equipment. A DD Form 1494 is not required for nontactical radios and LMRs operated in the US&P which are commercial; off-the-shelf; have no military nomenclature assigned; operate within 25 kHz channels over the 138-150.8, 162-174, or 406.1-420 MHz radio frequency bands; have transmitter output power less than 100 watts; and are FCC approved. However, using Navy agencies must have radio frequency assignments approved before they make contract to purchase.

(6) Low-Power Cordless Telephone Equipment. A DD Form 1494 is not required for low-power cordless telephones meeting the requirements of sub part D of part 14 of FCC Rules and Regulations.

(7) Built-in-test Equipment. A DD Form 1494 is not required for radiating built-in test equipment if radiation does not exceed the low-power rules specified in reference (c).

C106. <u>TIMELINESS OF SUBMISSION</u>

The review and approval process may take considerable time. Therefore, applicants should submit applications in sufficient time to allow for processing. The following guidelines apply:

a. Space systems - from four (4) to six (6) years, but not less than two (2) years before satellite launch.

b. Terrestrial systems - about three (3) years, but not less than one (1) year before operation.

c. Experimental systems - not less than six (6) months before conduct of the experiment.

C107. <u>COMPLETION OF THE DD FORM 1494</u>

a. The following guidance should be followed when completing a DD Form 1494:

(1) Use the actual tuning range(s) of the equipment.

(2) Include a releasability statement if the equipment is to be used outside the US&P.

b. The completed application should be assembled in a logical manner to facilitate review and preclude confusion. Toward this end, NAVEMSCEN has established a standard procedure of assembly and page numbering for the DD Form 1494. The procedures will be as follows:

(1) The DD Form 1494 is used to coordinate the frequency allocation application both nationally and internationally. It will be assembled in different order depending on the forum to which it is being submitted. This means that the NTIA General Information page will have more than one page number for different submittals and will have its page numbers assigned by NAVEMSCEN when the DD Form 1494 is assembled for submission. The originator should leave the "PAGE" block of this page blank.

(2) Other pages will be numbered as specified below. The DoD General Information page can only be page

1 and is pre-printed "Page 1 of ____ Pages." The originator should insert the total number of pages in the space provided. The correct number to insert is the total number of equipment characteristics pages (transmitter, receiver, and antenna) plus two (for the DoD and NTIA General Information pages) plus the total number of continuation pages, line diagram pages, and space systems data pages. The Foreign Coordination General Information page will also be a page 1. The equipment characteristics pages should be numbered sequentially beginning with the transmitter pages, then the receiver pages, and finally the antenna pages. The first transmitter page is always page 2. Each continuation page should be placed (and numbered accordingly) directly after the page that it continues. For example, a system planned for operation in CONUS and abroad that includes one transmitter, three receivers, and two antennas would have the following pages marked as follows:

Page	Numbered
DoD General Information	Page 1 of 9 Pages
Transmitter Equipment Characteristics (1)	2
Receiver Equipment Characteristics (3)	3, 4, 5
Antenna Equipment Characteristics (2)	6, 7
Line Diagram	8
NTIA General Information	(leave blank)
Foreign Coordination General Information	1

c. The DD Form 1494 is a multi-page form that may be classified. Classification determination and marking shall be in accordance with OPNAVINST 5510.1 ( ) and DoD Directive 5200.1-R.

(1) Frequently, individual pages are classified differently than other pages. For example, a system might have SECRET data on the transmitter and receiver equipment characteristics pages, CONFIDENTIAL data on the antenna equipment characteristics page but only unclassified data on the other pages. In this case, the overall classification is SECRET and each page is marked with the highest security classification of the data on that page. Each page has a classification block at the top and bottom. The terms "UNCLASSIFIED," "CONFIDENTIAL" or "SECRET" should be typed into those blocks.

(2) If a page is classified either CONFIDENTIAL or SECRET, then every block on that page shall be marked with its appropriate classification based on the data entered in that block. This block-by-block marking should conform with the paragraph marking defined in OPNAVINST 5510.1 ( ) and DoD Directive 5200.1-R.

(3) The overall (highest) classification of the document must be conspicuously stamped on the top and bottom of the first page and top and bottom of the back of the last page. In some cases, the first page will have a classification lower than the overall classification. When this happens, the classification block on top of the first page should contain either "This Page is UNCLASSIFIED" or "This Page is CONFIDENTIAL," as appropriate, in addition to the overall classification stamp.

(4) The application title (Block 1 of the DoD, NTIA, and Foreign Coordination General Information pages) should <u>never</u> be classified.

(5) The terms "Competition Sensitive" or "Proprietary Data" are not classifications and, therefore, should not be entered into the classification block. If the data contained on the form is of this nature, the words "Competition Sensitive" or "Proprietary Data" should be <u>typed</u> on the top and bottom margins of the form and/or stamped in the "Remarks" block. The J/F 12 process is designed to handle and protect proprietary data. Within a reasonable time period, the Competition Sensitive designation must be removed. After contract

award, the data on a DD Form 1494 cannot continue to be considered proprietary.

(6) Three pages (DoD General Information, NTIA General Information, and Foreign Coordination General Information) have "Downgrading Instruction" blocks at the bottom. The downgrading instruction for the presented information must be supplied for classified systems. All downgrading instructions must conform to the requirements of OPNAVINST 5510.1 ( ) and DoD Directive 5200.1-R. For unclassified systems, the entry "NA" is applicable.

d. This DD Form 1494 is the latest form revised by the USMCEB. Each block of the DD Form 1494 is explained on the back of that page with some information for completing the block. More specific instructions for completing the blocks of the DD Form 1494 are included on the following pages. A blank DD Form 1494 appears for reference at the end of Annex C (Figures C-1 to C-6).

PAGE 1 OF THE DD FORM 1494

DoD General Information

The first page of the DD Form 1494 contains general information concerning the nomenclature, use, number of equipments, and radio frequency requirements of the equipment being allocated.

Classification and Downgrading

See Paragraph 7.c. above.

Date

Enter the date of the application.

Page Numbering

See Paragraph 7.b. above.

Block To.

The addressee for all Navy DD Form 1494 submissions is:

Department of the Navy
Naval Electromagnetic Spectrum Management Office
CNO (OP-940T)
Washington, DC 20350-2000

Block From.

This block should have the mailing address of the office originating the DD Form 1494. This may be the command that is either procuring, developing, modifying, or using the equipment. This block should not contain the address of a non-DoD agency or office.

Block 1. Application Title

Enter the government nomenclature of the equipment, or the manufacturer's name and model number, and a short descriptive title.

Block 2. System Nomenclature

The system nomenclature is a title describing the radio frequency (RF) system being allocated. It should be unique to this RF component of the overall platform or weapons system. If a Joint Electronics Type Designation System (JETDS) nomenclature (AN nomenclature) has been assigned to the RF component being allocated, it should be listed in this block along with the name of the equipment. If a JETDS nomenclature is not assigned, a unique descriptive title must be entered; e.g., "AEGIS SM-2 (BLK I) Data Link." In the case of commercially produced off-the-shelf equipment, the title should include the manufacturer's name and model number, in addition to the descriptive title; e.g., "Conic Model TCM-604B High Density Microwave Relay." The System Nomenclature blocks on the NTIA General Information and Foreign Coordination General Information pages must be identical to that listed on the DoD General Information page. If a commercial transmitter and receiver made by different manufacturers are being allocated, the System Nomenclature block should reflect this. "Conic Model TCM-604B Transmitter and Watkins Johnson Model 1638

Receiver" would be a correct entry. The title should not be classified or marked competition sensitive. The manufacturer's name is not required in the case of competition sensitive equipment; it is perfectly acceptable to omit this information. Instead, the identifier "Model A" or "Contractor B" should be substituted. "Nomenclature not yet assigned" is not acceptable. When seeking allocation for a complex system made up of two or more RF subsystems, a separate DD Form 1494 must be submitted for each subsystem. For example, the AN/UPD-7 Surveillance System has two distinct RF components: the AN/APS-94 Radar and the AN/AKT-18 Communications Relay. An application for allocation for the AN/UPD-7 would require one complete form for the AN/APS-94 and one complete form for the AN/AKT-18.

Block 3. Stage of Allocation

Stages of allocation correspond to the stages of life cycle management. The amount and type of data required on the DD Form 1494 varies with the stage of allocation. The requirements for each stage are explained below:

STAGE 1 - "Conceptual." A conceptual allocation is prudent prior to releasing funds for studies or assembling "proof-of-concept" test-beds. Little more than the system purpose, the planned radio frequency range, planned system power, and operating location are required to be completed. It is highly desirable, however, that all other planned or estimated details concerning the equipment be entered on the DD Form 1494. Where information has not been determined, the entry "NAvail" or "Not Available" should be made. "Unknown" or "Unk" should NOT be used. The Stage 1 system normally does not radiate.

STAGE 2 - "Experimental." An experimental allocation is required prior to the release of funds for building a radiating test model or assignment of a radio frequency for experimental usage. This includes, but is not restricted to, units that will be tested within the laboratory. Estimated and calculated data can be used where appropriate for nearly all the blocks on the DD Form 1494.

STAGE 3 - "Developmental." Prior to release of funds for engineering development models or assignment of a radio frequency for developmental usage, a stage three allocation must be obtained. All applicable blocks of the DD Form 1494 should be filled in with measured data. Where measured data is not available, calculated data must be used. Any entries of "NAvail" must be accompanied by the reason for the non-availability.

STAGE 4 - "Operational." An operational radio frequency allocation is mandatory prior to release of funds for production units. Measured data for all measurable technical characteristics such as emission bandwidth, harmonic level, spurious level, etc., should be provided when submitting a Stage 4 radio frequency allocation application. All commercial off-the-shelf equipment whose RF characteristics have not been modified, fall into this stage of allocation. Although the equipment is sometimes being used within experimental or developmental systems, it is operational equipment, by definition, because of its off-the-shelf status (for example, an off-the-shelf telemetry system used during development of a missile).

Block 4. Radio Frequency Requirements

Two items of information must be listed in this block. They are the operational radio frequency band(s) and the emission designators.

a. Frequency(ies): Enter the required radio frequency band(s). For equipment designed to operate only at a single radio frequency, enter this radio frequency. Indicate units; e.g., kHz, GHz.

b. Emission Designator(s): Refer to Annex G.

Block 5. Target Starting Date for Subsequent Stages

These are the dates when the different life cycle management phases of the equipment are to be entered. A projected date for the start of all future phases should be given in this block. An "NA" should be entered on the line for all current and accomplished phases. Thus, the DD Form 1494 for a system going from the current Advanced or Engineering Development stage to the Operational or Production stage in November of 1992 will have "NA" for Stages 1, 2, and 3 and "November 1992" for Stage 4.

Occasionally, equipment is developed that is never intended to be introduced into the operational inventory. It may be a proof-of-concept test bed or a one-of-kind piece of laboratory equipment. This is indicated on the DD form 1494 by entering an "NA" for the Stage 4 date and an explanation in Block 13, "Remarks."

Block 6. Extent of Use

Some idea of the amount of time and the occurrence of operation of the equipment should be given. For equipment intended primarily for peacetime use, this should include the number of hours per day and days per week. For weapons systems and wartime-oriented systems, some idea as to the number of hours of operation per mission should be given. Most equipments (wartime systems included) have some use in a training role which should also be listed in this block. A sample entry in this block would read "Peacetime training, testing, and use will include approximately 2 hours per day, 5 days per week of intermittent transmissions. During wartime, system will operate at all times with intermittent one-minute transmissions, approximately 10 per hour." The information requested pertains to eventual Stage 4 operations.

Block 7. Geographical Area For

Enter the locations of all tests or operations of the equipment for each stage of allocation including the current stage. Enter "NA" for all accomplished stages.

For STAGES 1, 2, and 3: Wherever possible, specific sites, identified by geographic location and coordinates should be listed. When a large number of U.S. test sites is anticipated or the final sites have not yet been chosen, it is acceptable to state "various test sites in the US&P." Specific (rather than general) locations should be given whenever possible. All test sites outside the Continental United States (CONUS) must be identified by base, station, or military unit name and country.

For STAGE 4: The locations of operations should be as specific as possible. For fixed equipment, it should be possible to list the site locations by latitude and longitude. For mobile systems where no specific location can be identified, worldwide may be used as a last resort. Sea areas, coastal areas, or land areas worldwide are preferable. General rather than specific locations lead to time-consuming questions throughout the review process. Use continuation pages when the physical space on the DD Form 1494 is too small to list all locations and specific sites.

Block 8. Number of Units

This block should contain the total number of units being built, procured, or used at this stage of allocation. If the number of transmitters differs from the number of receivers, each should be identified and listed separately. When there is a one-for-one correspondence of transmitters to receivers, a single figure may be listed.

Block 9. Number of Units Operating Simultaneously in the Same Environment

The environment is defined to be the physical area over which the equipment signal can communicate or interfere. For a fixed microwave radio, this will usually be two units: the transmitting station and the receiving station. There may be only one radar in that radar's coverage area. In the case of a base police radio net, there may be dozens of "handie-talkies" within reception range of each other. The number of systems operating may be a variable, so a normal and a maximum value could also be given. The size of the area should also be stated (usually a radius value). The answer to Block 9 can never be "NA."

Block 10. Other J/F 12 Application Number(s) to be

A system should have four radio frequency allocations during its lifetime, as it transitions from one phase to another. Each allocation will have a distinct J/F 12 number assigned when an application is approved. Since each new allocation supersedes the existing allocation, it is necessary to supersede the existing J/F 12 number. Or, if two systems, each allocated separately, are to be used in conjunction with each other, it is necessary to relate the two J/F 12 numbers. This block is intended for these types of situations.

a. Superseded. This is the box most normally used when requesting a new allocation for an already allocated system. The title describes the action that will be taken by the USMCEB Frequency Panel and DON. This block should not be used to indicate that the system being allocated is replacing an existing system. Somewhere, someone will continue to operate the replaced system until it is phased out of the inventory and it will still need a valid radio frequency allocation. The J/F 12 number to be superseded should be listed on the line to the right of the "Superseded" box.

b. Related. This covers the cases of two separately allocated systems being used in conjunction with each other such as a newly developed earth station and an existing space station. The space station's J/F 12 number should be entered opposite the checked box marked "Related." "Related," as it is used on the DD Form 1494, does not extend to cover different systems performing the same or similar purposes, unless the two systems work together. For example, the TERRACOM TCM-604 and the TCM-608 perform a multichannel microwave relay function and have similar RF characteristics, but it is not generally correct to consider them "Related" unless used in the same installation.

Block 11. Operational Requirement

If this equipment will operate with the same or similar equipment used by other U.S. Military Services, DoD Components, U.S. Government Agencies, or Allied Nations, mark "Yes," and specify in Block 13, "Remarks," the Services, Agencies, or countries (to include the country's services).

Block 12. Names and Telephone Numbers

The name, and telephone number (both commercial and DSN) of the Program Manager and a Project Engineer are required. This information is necessary to permit contact between NAVEMSCEN and the Project Office during the processing of the allocation. The "Project Engineer" should be familiar with the RF parameters of the system, with whom direct liaison is authorized. In addition to the two required contacts, it is not uncommon to list a point of contact with the civilian contractor, if the equipment is being produced or developed by such a contractor. When the organization and address of the Project Engineer or Manager are different from the application originator, this information should be supplied in the "Remarks" section.

Block 13. Remarks

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block number. The security classification of any information should be identified next to the block number. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Downgrading Instructions

See Paragraph 7.c. above.

Classification (Bottom of Page)

Same as Classification at Top of Page.

APPLICATION FOR EQUIPMENT FREQUENCY ALLOCATION	CLASSIFICATION	DATE	*Form Approved* *OMB No. 0704-0188* Page 1 of Pages

DOD GENERAL INFORMATION

TO	FROM

1. APPLICATION TITLE

2. SYSTEM NOMENCLATURE

3. STAGE OF ALLOCATION *(x one)*
   ☐ a. STAGE 1 CONCEPTUAL ☐ b. STAGE 2 EXPERIMENTAL ☐ c. STAGE 3 DEVELOPMENTAL ☐ d. STAGE 4 OPERATIONAL

4. FREQUENCY REQUIREMENTS
   a. FREQUENCY(IES)
   b. EMISSION DESIGNATOR(S)

5. TARGET STARTING DATE FOR SUBSEQUENT STAGES

a. STAGE 2	b. STAGE 3	c. STAGE 4

6. EXTENT OF USE

7. GEOGRAPHICAL AREA FOR
   a. STAGE 2
   b. STAGE 3
   c. STAGE 4

8. NUMBER OF UNITS

a. STAGE 2	b. STAGE 3	c. STAGE 4

9. NUMBER OF UNITS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT

10. OTHER J/F 12 APPLICATION NUMBER(S) TO BE	11. IS THERE ANY OPERATIONAL REQUIREMENT AS DESCRIBED IN THE INSTRUCTIONS FOR PARAGRAPH 11?
☐ a. SUPERSEDED J/F 12 / ☐ b. RELATED J/F 12 /	☐ a. YES ☐ b NO ☐ c. NAvail

12. NAMES AND TELEPHONE NUMBERS

a. PROGRAM MANAGER	(1) COMMERCIAL	(2) AUTOVON
b. PROJECT ENGINEER	(1) COMMERCIAL	(2) AUTOVON

13. REMARKS

DOWNGRADING INSTRUCTIONS	CLASSIFICATION	

DD Form 1494, FEB 87 S/N 0102-LF-001-4941

Figure C-1, Sample form DD 1494, Page 1 DOD General Information

PAGE 2 OF THE DD FORM 1494

Transmitter Equipment Characteristics

The second page consists of information related to transmitter characteristics. In a multi-transmitter system, a copy of this page should be submitted for each different transmitter. While the information required is sufficient to provide a general description of the transmitter, it is not sufficient to describe transmitters employing spread-spectrum and other advanced-modulation techniques. The additional information required to adequately describe these transmitters must either be provided in Block 14, "Modulation Techniques and Coding," or Block 24, "Remarks," or on additional pages attached to the DD Form 1494. Should the DD Form 1494 be classified, each block of the page must be marked regarding its specific security classification.

Classification (Top of Page)

See Paragraph 7.c. above.

Page Numbering

See Paragraph 7.b. above.

Block 1. Nomenclature, Manufacturer's Model Number

If a JETDS nomenclature (AN nomenclature) has been assigned to the transmitter, it should be entered in this block. If no JETDS nomenclature has been assigned, a manufacturer's model name or part number should be entered instead. If the transmitter has neither type of identifier, as may occur in a conceptual, experimental research, or exploratory development allocation action, at least the system name followed by the word "transmitter" should be entered. The entry "None" or "Not Yet Assigned" is not valid in this data block. In a multi-transmitter system a nomenclature describing the purpose of each transmitter would be appropriate on each respective transmitter page. For example, "Motorola FSK Telecommand Transmitter" and "Motorola RPV ASK Telecommand Transmitter."

Block 2. Manufacturer's Name

If the system is being built or designed by a contractor, the contractor's name should be listed here. When a manufacturer's model number or part number is listed in Block 1, then the manufacturer's name must be listed here. If the development is solely within a Navy R&D laboratory, it is appropriate to list the name of the laboratory in this block. In the case where a manufacturer has not been selected, as may occur in a conceptual (Stage 1) system, an entry of "NAvail" is acceptable.

Block 3. Transmitter Installation

Required here is the platform(s) in or on which the transmitter is mounted; whether it is mounted at a fixed site atop a mountain, in an S-120 shelter, in a jeep, aboard a helicopter, etc. All military vehicles should be identified by their proper military nomenclature. If the system is portable, and not mounted in a vehicle, the user should be identified, e.g., man portable carried by military police or handie-talkie worn by flight deck crew or carried by base police.

Block 4. Transmitter Type

The general modulation type and transmitter purpose should be entered as a two- or three-word description. Examples are: "FM Communications," "Pulse Doppler Radar," "Spread-Spectrum Communication," etc. "Not Available" or "Not Applicable" are not permissible entries.

Block 5. Tuning Range

This should be the lowest-tunable center radio frequency through the highest-tunable center-radio frequency. As a matter of uniform convention, this tuning range should not include the transmitter's emission bandwidth. If the transmitter is normally not tunable (e.g., "Fixed Crystal"), the range of the lowest radio frequency obtainable by crystal substitution or cavity adjustment, through the highest, must be listed. This is true even if only one or several specific crystal radio frequencies are intended for use. At a later date, it may be necessary to shift the tuned radio frequency of the equipment, and by correctly indicating the capabilities of the system, the Navy spectrum manager can assess the ability of the system to operate in light of this shift. If the equipment truly cannot be tuned or in any way adjusted in radio frequency, the center radio frequency of the emission or reception should be listed in this block. An example of a truly fixed radio frequency system is an ATCRBS IFF/SIF interrogator which would have the entry of " 1030 MHz." The range listed in this block may differ from the range(s) given on page 1, Block 4, "Frequency Requirements," if there is more than one transmitter being used to cover the ranges or if the transmitter is capable of tuning over a greater range than is being requested for this allocation.

Block 6. Method of Tuning

This is another two or three-word descriptor with the format of "method of effecting change" and "device ensuring radio frequency output." Examples are: "Manually Adjusted Klystron Cavity," "Fixed Crystal," "Interchangeable Crystal," "Manually Adjusted Crystal Synthesizer, " etc. Even if no tuning is possible, the second half of the descriptor is valid. Thus, a non-tunable radar would still have an entry appropriate for this block: "Sealed Cavity Magnetron."

Block 7. RF Channeling Capability

For uniformly spaced channels, enter the center radio frequency of the lowest channel, and the increments between consecutive center radio frequencies and the number of channels, e.g., 406 MHz, 100 kHz increments, 20 channels. For continuous tuning, enter the lowest radio frequency and the word "continuous." For others, such as SSB, randomly spaced channels, or cases where channel selection is under software control, enter a detailed description in Block 24, "Remarks." Any constraints for using any of these channels also must be described in Block 24, "Remarks," e.g., degraded channels, internal hardwiring limitations, or lockout capability for radio frequency hopping systems. The title contains the word "RF." This is to qualify that only RF output channeling information is appropriate, not the input channeling description. Thus, multiple-input channels combined through "Time Division Multiplexing (TDM)" or "Frequency Division Multiplexing (FDM)" into one RF channel need not be described in this block. Multiplexing information should, however, be listed in Block 14, "Modulation Techniques and Coding," or Block 24, "Remarks." RF channeling does not include the net channels created by "Distributed Time Division Multiple Access (DTDMA)", but does include the actual radio frequency band(s) occupied by those nets.

Block 8. Emission Designator(s)

Refer to Annex G.

Block 9. Frequency Tolerance

Radio frequency tolerance is defined as follows:

Radio frequency tolerance =

$$\frac{\text{maximum transmitter drift (Hz)}}{\text{center radio frequency (MHz)}}$$

It should be expressed in "parts per million (ppm)," rather than actual radio frequencies or a percentage of the center radio frequency. A 1 MHz center radio frequency transmitter that can drift 1 Hz has a radio frequency tolerance of 1 ppm. A 100 MHz transmitter with a drift of 10 Hz has a tolerance of 0.1 ppm. (NOTE: Single sideband radio frequency tolerance may be expressed in Hz.) The stability of a transmitter is a function of many factors. It may depend on transmitter temperature, age, or center-radio frequency selection. The value entered into Block 9 should represent the nominal transmitter conditions. Thus, it should reflect operations at the intended operating temperature, a time sufficiently into the equipment's life cycle to exclude "Break-in" or "Pre-Burn-In" variations, and after an adequate warm-up period. It is not necessary to list these conditions in Block 9.

Block 10. Filter Employed

Any filter employed between the final RF stage and the antenna should be indicated in this block, according to its type. Additional information and filter specifications should be listed in Block 24, "Remarks." An example of this additional information would be the entry, "Block 10: 3-pole LP Butterworth filter with 1.5 dB in-band insertion loss and a minimum of 85 dB attenuation at 25 MHz removed from the tuned radio frequency."

Block 11. Spread Spectrum

If spread spectrum techniques are being employed, check the "YES" box and provide a complete description of how the spreading is achieved in Block 14, "Modulation Techniques and Coding" and Block 24, "Remarks." Spread spectrum is defined by the IEEE as "a modulation technique for multiple access, or for increasing immunity to noise and interference. Spread spectrum systems make use of sequential noise link signal structures, for example, pseudonoise (PN) codes, to spread the normally narrowband information signal over a relatively wide band of radio frequencies. The receiver correlates these signals to retrieve the original information signal." The principal spread spectrum methods are direct sequence, radio frequency hopping, and a hybrid of the two. Some examples of a "Remarks" entry would be "Direct sequence pseudorandom noise is used to spread the bandwidth of the telecommand signal. Signal information rate = 14.6 kbits/sec and chip rate = 18.5 Mbits/sec" or "Radio frequency hopping is employed using 21 discrete software selected channels within the tuning range. The hop rate is 20 Khops per sec."

Block 12. Emission Bandwidth

This block should contain information regarding the approximate spectral energy distribution of the transmitted signal. The term "emission bandwidth" applies to that transmitter energy appearing at the antenna terminals and includes any significant attenuation contributed by filtering in the output circuit or transmission lines. During conceptual and experimental phases, the waveform envelope may be calculated. For developmental and operational allocations, measured data should be provided. The bandwidths of the signals at points -3, -20, and -60 dB relative to the fundamental signal level are required and should not include the tuning range or carrier movement. Spread spectrum (radio frequency hopping) signals should be measured at one radio frequency only, as it is used instantaneously. The -40 dB bandwidth need only be supplied for pulsed radar systems; an entry of "NA" is acceptable for all other types of systems. Line 12.e. asks for the occupied bandwidth which is defined by the DoD as the band within which 99% of the total emitted energy is contained. Under no circumstances can the occupied bandwidth be less than the necessary bandwidth listed in Block 8, "Emission Designator(s)." A complete set of bandwidths must be listed for each different rise, fall, and/or width time listed in Block 18. In addition, a complete set of emission bandwidths must be included for each different emission designator listed in Block 8. For instance, a transmitter may be capable of transmitting both pulse doppler and chirped FM emissions. In this case, two emission designators would be indicated in Block 8, and correspondingly, two emission bandwidths must be listed in Block 12. Additional sets of bandwidths should be put in Block 24, "Remarks" or on continuation pages.

Block 13. Maximum Bit Rate

This applies only to digital communications systems. It does not mean pulses per second for a radar. Enter the maximum information bit rate for digital equipment in bits per second (bps).

Block 14. Modulation Techniques and Coding

Describe in detail the modulation and coding techniques employed. For complex modulation schemes such as direct sequence spread spectrum, radio frequency hopping, radio frequency agile, etc., enter full details in Block 24, "Remarks." An example of an entry in this block would be "A 13 bit Barker Code is used to "compress" the radar pulses."

Block 15. Maximum Modulation Frequency

This applies only to frequency-modulated or phase modulated systems. It is the point that is 3 dB down on the high side of the modulating signal spectrum after any compensation. In other words, it is the highest input frequency that can be successfully transmitted. In the case of a standard analog voice communications radio, the maximum modulation frequency is designed to be 3 kHz, the highest frequency the human voice normally produces in speech. In the case of a multi-channel, frequency-division multiplexed radio, the maximum modulation frequency is the highest frequency of the highest channel after being multiplexed. This is generally easy to calculate. If the radio multiplexes 10 channels, and uses 3 kHz/channel, the highest modulation frequency is 10 x 3 kHz or 30 kHz. For amplitude- and pulse-modulated systems, the correct entry is "NA."

Block 16. Pre-Emphasis

This is applicable only to analog frequency modulated systems. Pre-emphasis refers to preferential amplification of the higher modulating frequencies. Typically, the amplification is 6 dB per octave. If the exact amount of pre-emphasis is known, it should be entered in the space provided in the right-hand portion of the block. Pre-emphasis is common in commercial, off-the-shelf equipment. It is not generally found in military radios. The "NO" block should be checked for amplitude, digital FM, phase, and pulse-modulated systems.

Block 17. Deviation Ratio

This block applies only to frequency-modulation or phase-modulation equipment. For FM systems, the deviation ratio is the ratio of the maximum amount the one-sided RF emission deviates from the center radio frequency (frequency deviation), to the maximum frequency of the input modulating signal. For FM systems the radio frequency deviation is directly proportional to the amplitude of the modulating signal, since the amount of carrier radio frequency "swing" is tied to the amplitude variance of the modulator. In PM systems, the deviation ratio is tied to both the amplitude of the modulating signal and phase deviation constant of the modulator. The PM deviation ratio is not a function of the frequency of the input modulating signal.

Example: For an FM system a deviation ratio of 1 indicates that a 3 kHz input frequency will cause a peak instantaneous radio frequency carrier deviation of 3 kHz. A deviation ratio of 3 would result in a 9 kHz deviation of the emission when modulated with a 3 kHz signal. The formula for the deviation ratio of FM systems is:

$$\text{Deviation Ratio} = \frac{\text{Maximum Deviation from } f_c}{\text{Maximum Modulating Frequency}}$$

For FSK digital FM systems, the deviation ratio is given as follows:

$$\text{Deviation Ratio} = \frac{f_2 - f_1}{f_b}$$

where: f_2 = mark frequency

f_1 = space frequency

f_b = bit rate

"NA" should be entered in this block for all amplitude- and pulse-modulated systems.

Block 18. Pulse Characteristics

As the title implies, this is applicable only to pulse-modulated systems. It is not appropriate to enter data concerning short duration FM and AM emission transmitters (e.g., radio frequency hopping) in this block. Information concerning transmission rates of repetitive AM or FM emission should be entered Block 24, "Remarks," or on a continuation sheet.

a. Rate - Pulse rates should be listed for individual pulses. While "pulse pairs" are commonly used in IFF system specifications, it is not correct to list the pulse-pairs repetition rate in this block. Rather, the number of individual pulses per second (reciprocal of minimum pulse interval) is the correct figure. If several different pulse rates are employed by the system, each rate should be listed, rather than just the maximum rate. If the different pulse widths are associated with different pulse rates, then the association should be indicated.

b. Width - The pulse width is that time period during which the voltage to the antenna exceeds 50% of the highest voltage that will be conducted to the antenna. This time period is measured in microseconds. The pulse width of a transmitter cannot exceed one divided by the pulse rate (1/pulse rate). To do so would yield a transmitter duty-cycle of greater than 100%. If several different pulse widths are employed by the system, each pulse width should be listed, rather than just the widest pulse.

c. Rise Time - The pulse rise time is the time duration required for the leading edge of the RF voltage envelope being supplied to the antenna to rise from 10% to 90% of its peak amplitude. The time is measured in microseconds. As can be seen by comparison, there is an overlap between the rise time period and the pulse width period. The pulse rise time is the major contributing factor to the overall pulse width and the spectral power distribution. Thus, different rise times will cause different RF emission bandwidths. For this reason, each different pulse rise time listed in Block 18(c) must be accompanied by the attendant RF emission bandwidths. These bandwidths should be listed in column form in either Block 12 or Block 24. If pulse rise and fall times are given as a range of values, the RF emission bandwidths should be calculated for the upper and lower limits of the range unless measured data is provided.

d. Fall Time - The pulse fall time is the duration required for the trailing edge of the RF voltage envelope being supplied to the antenna to fall from 90% to 10% of its peak amplitude. This time period is measured in microseconds. Again, it can be seen that this time period overlaps with the pulse-width time-period.

e. Compression Ratio - The previous four pulse parameters (rate, width, rise time, and fall time) apply to all pulse-modulated systems and must be supplied. The last parameter in Block 18, the pulse compression ratio, applies only to non-linear or linear-frequency-modulated (LFM) pulse-modulation systems. An LFM PM system is one in which the carrier radio frequency is changed linearly during the pulse period. The compression ratio is the pulse width (in seconds) times the carrier radio frequency displacement (in Hz). Thus, a 50 microseconds pulse width with a linear FM (or chirp) of 1 MHz has a pulse compression ratio of 50. A phase coded pulse modulating system divides a pulse into N subpulses and then phase modulates the carrier accordingly. The code used to describe the phase of each subpulse is generally a "Barker Code" or m-sequence code. The compression ratio is N, the number of subpulses. The rise and fall time of the subpulse should be entered in Block 24, "Remarks." "NA" should be entered in this block for all amplitude and angle modulated systems.

Block 19. Power

The requirements for each entry are as follows:

a. Mean Power - This is applicable to all non-pulsed forms of modulation except single-sideband amplitude modulation. The mean or average power is defined as the power supplied to the antenna transmission line averaged over a time sufficiently long compared with the period of the lowest radio frequency encountered in the modulation. A time of 1/10 second during which the mean power is greatest is normally selected. For a pulsed system, the average power can be calculated as:

Average Power = Peak Power x Duty Cycle

Duty Cycle = Pulse Rate x Pulse Width

b. Peak Envelope Power (PEP) - This block must be completed for all single-sideband amplitude-modulated systems, all pulse modulated systems, and amplitude-modulated television systems. The PEP is defined as the average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the highest crest of the modulation envelope, taken under conditions of normal operation.

Block 20. Output Device

This refers to the final RF output device. Examples are: "Magnetron," "Traveling Wave Tube (TWT)," "Transistor pair in Class C amplifier configuration," "Impatt diode," "Gunn diode," etc. The specific device designation should also be supplied, for example, "Varian VTS5751A1 TWT."

Block 21. Harmonic Level

All RF transmitters emit energy at various radio frequencies in the spectrum outside the necessary bandwidth. These out-of-band emissions are referred to as "spurious emissions." The highest levels of spurious energy generally occur at radio frequencies that are multiples or "harmonics" of the center radio frequency. Thus, a transmitter tuned to 30 MHz will also emit energy on 60 MHz, 90 MHz, and 120 MHz, etc. On the DD Form 1494, Block 22 is for the non-harmonic spurious emissions and Block 21 is for the harmonic spurious emissions. Block 21 requires that three different harmonic powers be listed, all in dB relative to the fundamental power; 2nd, 3rd, and "OTHER." The 2nd harmonic emission falls at the radio frequency equal to 2 times the fundamental radio frequency while the 3rd harmonic is located at 3 times the fundamental radio frequency. The "Other" referred to in Block 21(c) is the greatest harmonic emission power level above that of the 3rd harmonic. Harmonic emission power levels tend to decrease the farther away they fall above the fundamental radio frequency. Thus, the 2nd harmonic power level is generally greater than the 3rd and the 3rd would be expected to be greater than that listed under "Other."

Block 22. Spurious Level

A non-harmonic spurious emission is one lying outside the emission bandwidth measured at the -60 dB point. The power of a spurious emission is measured in decibels relative to the peak output of the carrier signal (dBc) never an absolute level (dBm or dBw). The carrier signal, or fundamental emission, is always designated as 0 dB. Thus, a spurious emission with a peak power of 80 dB below that of the fundamental has a relative level of -80 dB. The units used in this block should always be minus dB. Whenever possible, the spurious power level should be determined from the actual radiated spectrum of the transmitter. If it is not possible to conduct radiated spectrum measurements, the spectrum present at the antenna terminals should be measured. The least desired but still acceptable method of measurement is measuring the spurious power levels present in the final RF stage of the transmitter. Where the measurement was made (radiated, antenna terminals, or transmitter final stage) should be indicated in this block.

Block 23. FCC Type Acceptance No.

This only applies to commercial off-the-shelf equipment. Civilian equipment parameters are reviewed by the FCC in a manner similar to the DoD radio frequency allocation process. An FCC type acceptance number is assigned to all equipment passing this review. The number assigned is generally the same as the manufacturer's model number. For example, the FCC type acceptance number for the TERRACOM TCM-602 Transmitter is "TCM-602." <u>FCC type acceptance does not exempt an equipment from the DoD radio frequency allocation process.</u> A radio frequency allocation is still required for all equipment developed, leased, modified, or procured by any DoD agency or contractor in support of a DoD contract. If the equipment is being modified or is commercial equipment without a type acceptance, "NA" is the proper response in this block.

Block 24. Remarks

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block number. The security classification of any information contained in the

"Remarks" block must be explicitly marked. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Classification (Bottom of Page)

Same as classification at top of page.

CLASSIFICATION

PAGE

TRANSMITTER EQUIPMENT CHARACTERISTICS

1. NOMENCLATURE, MANUFACTURER'S MODEL NO.

2. MANUFACTURER'S NAME

3. TRANSMITTER INSTALLATION

4. TRANSMITTER TYPE

5. TUNING RANGE

6. METHOD OF TUNING

7. RF CHANNELING CAPABILITY

8. EMISSION DESIGNATOR(S)

9. FREQUENCY TOLERANCE

10. FILTER EMPLOYED *(X one)* ☐ a. YES ☐ b. NO

11. SPREAD SPECTRUM *(X one)* ☐ a. YES ☐ b. NO

12. EMISSION BANDWIDTH *(X and complete as applicable)* ☐ CALCULATED ☐ MEASURED

a. -3 dB

b. -20 dB

c. -40 dB

d. -60 dB

e. OC-BW

13. MAXIMUM BIT RATE

14. MODULATION TECHNIQUES AND CODING

15. MAXIMUM MODULATION FREQUENCY

16. PRE-EMPHASIS *(X one)* ☐ a. YES ☐ b. NO

17. DEVIATION RATIO

18. PULSE CHARACTERISTICS

a. RATE

b. WIDTH

c. RISE TIME

d. FALL TIME

e. COMP RATIO

19. POWER

a. MEAN

b. PEP

20. OUTPUT DEVICE

21. HARMONIC LEVEL

a. 2nd

b. 3rd

c. OTHER

22. SPURIOUS LEVEL

23. FCC TYPE ACCEPTANCE NO.

24. REMARKS

CLASSIFICATION

DD Form 1494, FEB 87 S/N 0102-LF-001-4941

Figure C-2, Form DD 1494, Page 2 Transmitter Equipment Characteristics

PAGE 3 OF THE DD FORM 1494

Receiver Equipment Characteristics

The third page consists of information related to receiver characteristics. A copy of this page should be submitted for each different receiver in a multireceiver system where the elements are not identical. When all elements of different receivers are identical, they may be placed on one page. As previously stated in instructions for the completion of Page 1, each block of the page must be marked regarding the security classification, should the DD Form 1494 contain information that is higher than UNCLASSIFIED.

Classification (Top of Page)

See Paragraph 7.c. above.

Page Numbering

See Paragraph 7.b. above.

Block 1. Nomenclature, Manufacturer's Model Number

If a JETDS nomenclature (AN nomenclature) has been assigned to the receiver, this nomenclature should be entered in this block. If no JETDS nomenclature has been assigned, a manufacturer's model name or part number should be entered instead. If the receiver has neither type of identifier, as may occur in conceptual or experimental research or exploratory development allocation actions, at least the system name followed by the word "receiver" should be entered. In a multireceiver system, a title describing the purpose of each receiver would be appropriate on the respective receiver pages. The entry "None" or "Not Yet Assigned" is not valid in this data block.

Block 2. Manufacturer's Name

Enter the manufacturer's name if a manufacturer's model number is listed in Block 1. If the development is solely within a Navy R&D laboratory, it is appropriate to list the name of the laboratory in this block.

Block 3. Receiver Installation

The same type of information is required here as was required in Block 3 of Page 2. If the transmitter and the receiver are collocated, it is sufficient to enter, "same as transmitter." If the receiver is mounted in a vehicle or a military shelter, the proper military nomenclature of the platform is required. If the equipment is portable and not vehicle-mounted, the user or level of deployment must be provided.

Block 4. Receiver Type

The number of stages of superheterodyne-conversion, general modulation-type, and receiver purpose should be entered as a four- or five-word description. If the receiver is not a superheterodyne type, either "homodyne," "tuned radio frequency (TRF)," or "regenerative" should be substituted, depending on the form of detection used. A homodyne receiver mixes the incoming RF signal with a signal very close in radio frequency, thereby converting the RF to baseband without using an intermediate or IF stage. This form of detection is quite often used with doppler radars. The incoming RF is mixed with a low level sample of the signal being output by the transmitter. The resulting baseband signal is the amount of doppler-induced shift. A TRF or regenerative receiver uses the received signal in a positive feedback manner to generate oscillation within the detector itself. This technique is rarely used in modern communications and radar systems. The format is the "Number of superheterodyne stages," followed by "General Modulation Type," followed by "Purpose." Examples are: "Single Conversion FM Communications," "Homodyne Doppler Pulse Radar," "Double Conversion Spread Spectrum Communication," "Crystal Video ESM," etc. An entry of "Not Available" or "Not Applicable" is not permissible.

Block 5. Tuning Range

This should be the lowest tunable center radio frequency through the highest tunable center radio frequency. Do not include the receiver acceptance bandwidth as part of this range.

Block 6. Method of Tuning

See Block 6 of Transmitter Page.

Block 7. RF Channeling Capability

See Block 7 of Transmitter Page.

Block 8. Emission Designator(s)

Refer to Annex G.

Block 9. Frequency Tolerance

This is the maximum drift of a receiver from its assigned radio frequency. It should be expressed in parts per million (ppm) for all emission types except single sideband which shall be expressed in Hertz. Also see Block 9 of Transmitter Page.

Block 10. IF Selectivity

This applies to all superheterodyne receivers. The bandwidths of the intermediate frequency (IF) or frequencies should be listed. When there is more than one IF stage in the receiver, Block 10 provides separate columns. There must be a separate set of bandwidths for each IF stage. The number of IF stages corresponds to the number of frequencies listed in Block 12, "IF Frequency," and the number of stages of conversion indicated in Block 4. Thus, a receiver described as a "triple conversion" receiver must have three sets of bandwidths listed in Block 10 and three frequencies listed in Block 12. Generally, the IF bandwidths are smaller than the RF bandwidth, with each successive IF stage having a smaller or equal bandwidth than the previous one. Since the final IF filter must pass the modulated signal at the translated carrier frequency, its bandwidth should equal or exceed the necessary bandwidth listed in Block 8, "Emission Designator(s)." However, the final IF stage is also responsible for rejecting unwanted carriers in the immediate vicinity of the desired signal or "adjacent-channel selectivity." Thus, the final IF bandwidth should not be much larger than the necessary bandwidth(s). If the receiver is a homodyne or a TRF type receiver, the appropriate entry in this block is "NA."

Block 11. RF Selectivity

The acceptance bandwidths of the RF circuits preceding the mixer or detector are required in this block. These bandwidths should reflect the attenuation of the received signal by the antenna, the antenna-transmission line, any RF pre-selection-filters, and any RF pre-amplifiers. The bandwidth curve of the mixer selectivity should be greater than or equal to the curve of the received signal. If this is not the case, information will be lost because of the inability of the receiver to accept the entire signal. To avoid the waste of spectrum, some form of pre-selection or filtering should be used to match, as closely as possible, the receiver selectivity curve to the transmitter signal's bandwidth curve. The significant types of pre-selection employed must be entered in line (d). Possible entries are "waveguide cutoff", "YIG filter," "6-pole Butterworth filter," etc. The primary purpose of the RF stage is to reject the "image" and other spurious signals before they get to the mixer. Thus, the RF bandwidth need be no smaller than four times the IF frequency at the desired image rejection level. Receivers, such as the heterodyne type, which omit the RF stage have no protection from spurious signals located on the image frequencies.

Block 12. IF Frequency

In a superheterodyne receiver, each conversion stage yields an intermediate frequency (IF). The IF frequency results from subtraction between the local oscillator frequency and either the radio frequency (in the first mixer) or the IF of the previous conversion stage (in all mixers after the first). Block 12 has blanks for three IFs. There must be different IFs listed for each set of IF selectivity bandwidths listed in Block 10, "IF

Selectivity." The number of IFs listed should also correspond to the number of stages of conversion indicated in Block 4. Additional IFs can be listed in Block 21, "Remarks." If a receiver is a homodyne or a TRF receiver, "NA" should be entered in all lines of this block. If only one IF is employed, an "NA" should be entered in the "2nd" and "3rd" columns. All IFs should be labeled with their correct unit of measurement, i.e., MHz, kHz, etc.

Block 13. Maximum Post Detection Frequency

This is the highest baseband frequency that can be recovered and demodulated by the receiver. Specifically, this frequency should have less than 3 dB attenuation relative to the least attenuated multiplexed signal. For a single channel analog device system, this maximum post detection frequency is generally 3 kHz, the highest frequency normally produced by the human voice in speech. For a multichannel, frequency division multiplexed receiver, the maximum post detection frequency is the highest frequency of the highest channel, after detection, but prior to demultiplexing. Only analog modulated systems are applicable here. For a pulse modulated system, the correct entry would be "NA." If the low frequency response is a significant parameter, then the 3 dB low frequency cutoff should be provided in the "Remarks" block.

Block 14. Minimum Post Detection Frequency

This block only applies to multichannel FM frequency division multiplexed receivers. The minimum post detection frequency is the lowest frequency of the lowest channel, measured after detection, but prior to demultiplexing. For amplitude-modulated, pulse-modulated, and single-channel-frequency-modulated systems, the appropriate entry is "NA."

Block 15. Oscillator Tuned

This block refers to the local oscillator and whether it is tuned above or below the center radio frequency. If the receiver is a homodyne or TRF type, the entry "NA" should be made instead of checking one of the boxes. If more than one stage of conversion is employed, the relationship of the additional local oscillators relative to their IFs should be listed in Block 15.

Block 16. Maximum Bit Rate

This applies only to digital communications systems. It does not mean pulses per second for radar, unless the radar is also transmitting or receiving information. For direct-sequence spread-spectrum emissions, the error-correcting coded information bit rate, not the modulating "chip" rate, should be entered. The baud rate should be provided if not equal to the bit rate. For all non-digital systems, the correct entry for this block is "NA."

Block 17. Sensitivity

This block is divided into four parts: minimum acceptable signal level, criteria defining an acceptable signal, noise figure, and equipment noise temperature.

a. Minimum Acceptable Signal Level - This is the minimum RF signal power required at the receiver input terminals that will ensure a successful detection and demodulation. Generally, a receiver will have an absolute sensitivity threshold lower in power than the minimum acceptable level. However, this lower absolute threshold is not sufficient to be processed, rather it will be demodulated as noise. Signal power levels must be specified in decibels above a mW (dBm). Field strengths in microvolts per meter are not acceptable.

b. Criteria Defining An Acceptable Signal - As explained above, there is a minimum acceptable signal power level, and there is an absolute threshold power level. Ideally, the criteria should be the difference between these two levels after all receiver processing. It should take the form of a signal-to-noise ratio (S/N), or a signal-to-interference-plus-noise and distortion ratio (SINAD) and be measured in decibels. This is not always feasible. Quite often, the criteria in data systems is a bit-error rate (BER), if the subject system is a digital communication radio or is a certain probability of successful reply, if the system is a transponder. Other acceptable criteria include "Minimum Discernable Signal (MDS)," and "Automatic Gain Control (AGC) response."

c. Noise Figure - Noise Figure is the measure of the internal receiver noise present in the output. It is the ratio of the input S/N ratio to the output S/N ratio at the standard temperature of 290 degrees Kelvin. An Equivalent Noise Temperature can be calculated from the noise figure as follows: T(equivalent) = (f - 1) 290 degrees, where T(equivalent) is Equivalent Noise Temperature in degrees Kelvin and "f" is the Noise Figure (actual ratio, not decibels). Enter "NA" for space systems.

d. Noise Temperature - This data, used only with space systems, is particularly necessary when the sensitivity criteria has been given as something other than S/N ratio. The noise temperature corresponds to the temperature of a thermal noise source that produces the same amount of noise as the receiver. Typically, a cooled earth-station receiver has an equivalent noise temperature of 30^{o} - 70^{o} K. Enter "NA" for terrestrial systems.

Block 18. De-Emphasis

De-emphasis in the receiver works in conjunction with pre-emphasis in an FM transmitter. It is a noise suppression technique where the high frequencies that were artificially amplified prior to transmission are compressed back to their original levels. De-emphasis is common in commercial off-the-shelf FM radios. It is not generally found in military-developed radios. If the subject system is amplitude-, phase-, or pulse-modulated, or is an FM system not possessing de-emphasis, the "NO" block should be checked.

Block 19. Image Rejection

Image rejection is not applicable to homodyne and TRF receivers. The "image" signal generated in a receiver is a special case of spurious signal. Generally, in a heterodyne receiver, the selected RF signal mixes with the local oscillator signal to produce an IF of lower frequency. However, there always exists an image frequency which when the RF mixes with the local oscillator signal, combines to form an IF of higher frequency. It is called the image frequency because it is exactly one IF away from the LO on the opposite side of the RF. The lower IF generated by the desired signal is the same frequency as the higher IF generated by the image signal. If this image signal is not attenuated prior to forming its IF signal atop the desired IF signal, it will appear as interference in the final output. By filtering the raw RF in the pre-selection and the output of each mixer stage sufficiently, it is possible to attenuate the image frequency signal to a point where it can no longer cause interference. A measure of the amount of provided attenuation is what is required in Block 19. As with the spurious rejection called for in Block 20, it should be expressed as a power ratio relative to the attenuation experienced by the desired signal as it passes through the receiver processing. The correct units of measurement are decibels.

Block 20. Spurious Rejection

Spurious signals are produced in the mixers of a superheterodyne receiver when the RF or IF signal combines with the local oscillator frequency in other than one-to-one relationship. Spurious RF signals can also combine with the local oscillator frequency in other than one-to-one ratios and cause spurious signals within the mixer of the receiver. Unless rejected through a proper choice of intermediate frequencies and interstage filtering, these signals can appear as noise and interference in the desired receiver output. The spurious rejection figure called for in Block 20 is the attenuation of spurious signals offered by the receiver filters and IF stages. It should be expressed in a power ratio relative to the attenuation experienced by the desired signal as it passes through the detection and demodulation process. Thus, the value for receiver spurious-rejection must be measured in decibels.

Block 21. Remarks

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block numbers. The security classification of any information contained in the "Remarks" block must be explicitly marked. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Classification (Bottom of Page)

Same as classification at top of page.

CLASSIFICATION	PAGE

RECEIVER EQUIPMENT CHARACTERISTICS

1. NOMENCLATURE, MANUFACTURER'S MODEL NO.	2. MANUFACTURER'S NAME
3. RECEIVER INSTALLATION	4. RECEIVER TYPE
5. TUNING RANGE	6. METHOD OF TUNING
7. RF CHANNELING CAPABILITY	8. EMISSION DESIGNATOR(S)
9. FREQUENCY TOLERANCE	

10. IF SELECTIVITY	1st	2nd	3rd
a. -3 dB			
b. -20 dB			
c. -60 dB			

11. RF SELECTIVITY *(X and complete as applicable)*

☐ CALCULATED ☐ MEASURED

a. -3 dB	
b. -20 dB	
c. -60 dB	
d. Preselection Type	

12. IF FREQUENCY	
a. 1st	
b. 2nd	
c. 3rd	

13. MAXIMUM POST DETECTION FREQUENCY	
14. MINIMUM POST DETECTION FREQUENCY	
16. MAXIMUM BIT RATE	

15. OSCILLATOR TUNED	1st	2nd	3rd
a. ABOVE TUNED FREQUENCY			
b. BELOW TUNED FREQUENCY			
c. EITHER ABOVE OR BELOW THE FREQUENCY			

17. SENSITIVITY	
a. SENSITIVITY	dBm
b. CRITERIA	
c. NOISE FIG	dB
d. NOISE TEMP	Kelvin

18. DE-EMPHASIS *(X one)*

☐ a. YES ☐ b. NO

19. IMAGE REJECTION	20. SPURIOUS REJECTION

21. REMARKS

CLASSIFICATION

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Figure C-3, Form DD 1494, Page 3, Receiver Equipment Characteristics

PAGE 4 OF THE DD FORM 1494

Antenna Equipment Characteristics

It is very common for different receiver and transmitter antennas to be employed, or for several different antennas to be associated with the same transmitter. In either of these cases, multiple copies of this page, correctly numbered, must be included in the application. No attempt should be made to describe several antennas on the same page. The resulting confusion will cause either incorrect system information to be filed or the DD Form 1494 application will be returned to its submitter.

Classification (Top of Page)

See Paragraph 7.c. above.

Page Numbering

See Paragraph 7.b. above.

Block 1. Purpose of Antenna

The antenna being described on this page can be a transmitting antenna, a receiving antenna, or it can be used to transmit and receive. If separate but identical antennas are used for transmitting and receiving, as might be the case in a microwave relay, one "Page 4" need be submitted and the "Transmitting and Receiving" block should be checked. The fact that two identical antennas are being used should be noted in Block 10, "Remarks." Similarly, if two or more identical antennas are employed in a space-diversified or multi-area coverage system, then only one page is required for each antenna type. Again, how the antenna is being used must be explained further in the "Remarks" block.

Block 2. Nomenclature, Manufacturer's Model Number

If a JETDS nomenclature (AN nomenclature) has been assigned to the antenna, this nomenclature should be entered in this block. If no JETDS nomenclature has been assigned, a manufacturer's model name, or part number should be entered instead. If the antenna has neither type of identifier, as may occur in conceptual or experimental research or exploratory development allocation actions, at least the system name followed by the word "antenna" should be entered. In a multi-antenna system, a title describing the purpose of each antenna would be appropriate on the respective antenna pages. The entry "None" or "Not Yet Assigned" is not valid in this data block.

Block 3. Manufacturer's Name

Enter the manufacturer's name if a manufacturer's model number is listed in Block 2. If the development is solely within a Navy R&D laboratory, it is appropriate to list the name of the laboratory in this block.

Block 4. Frequency Range

Two types of antennas may be employed by the system: those that operate over a radio frequency range wider than the system's tuning range and those whose operating range does not completely cover the system's tuning range. In the first case, the tuning range of the transmitter or the receiver should be entered into Block 4. For the second case, the efficient operating radio frequency range of the antenna should be put in Block 4. The efficient operating radio frequency range is defined as the radio frequency range over which the antenna's radiated output does not vary by more than 3 dB when measured at a fixed location in the main beam. A practical example of the two cases is an antenna capable of radiating from 200-300 MHz. When attached to a transmitter capable of tuning from 206-215 MHz, the antenna tuning range would be "206-215 MHz". Conversely, the same antenna linked to a 225-400 MHz transmitter would be listed with a "225-300 MHz" tuning range. The antenna may be used over more than the efficient operating range in which case the variation in gain over the range employed will be indicated in Block 10.

Block 5. Type

This block requires a generic classification of the antenna. The description must include information regarding either the physical or electrical size of the antenna. Examples are: "quarter-wave dipole," "three-meter horn fed parabolic reflector," "10-meter Cassegrain reflector with half-wave dipole feed," etc. The description should be as explanatory as possible. If the space in Block 5 is insufficient, the description of any and all antenna peculiarities should be continued in Block 10, "Remarks." Reference to a technical article should be provided for unique antenna designs. All physical measurements should be expressed in metric units of measurement. If available, illumination functions (such as cosecant, cosecant-squared, etc.) should be provided in this block. Illumination functions are discussed further in the instructions for Block 9, "Beamwidth."

Block 6. Polarization

Polarization refers to the orientation of the radiated electromagnetic wave relative to the ground plane. Four common orientations are: "linear-horizontal, " "linear-vertical," "left-hand circular," and "right-hand circular." An antenna always radiates in one or more of these polarizations. The particular polarization or polarizations of the antenna being described on this page should be entered in this block. If the polarization of the antenna can be changed, this should be noted in the "Remarks" block, along with a description of how the change is accomplished.

Block 7. Scan Characteristics

A complete description of the antenna's scan pattern or its range of motion should be provided in this block. Since antenna scanning has so many variables and can be rather complex, Block 10, "Remarks," should also be used to explain any antenna scanning not clearly described by Block 7. "Sidelobe Adaptive" antennas can only be described adequately by using Block 10, "Remarks." A simple illustration is especially useful in describing antennas, their radiation patterns, and their scan formats.

a. Type. Antennas may be fixed or scanned. There are two basic types of scanning or antenna beam movement: electronic and mechanical. The term "electronic" denotes an antenna that does not physically move, but rather shifts the direction of the main beam by means such as switching antenna elements on and off. The movement of an antenna by a servomotor or rotor is not electronic scanning, but mechanical. Scanning may also be accomplished by a combination of these two types.

(1) In addition to the type of scan, the scan format should also be entered on line (a). Examples of some common scan formats are "search while track," "conical scan," "box scan," "raster scan," "3D," "vertical only," and "horizontal only." Thus, the complete entry on line (a) might be "electronic conical scan," or "mechanical vertical only scan." In some cases, both electronic and mechanical scanning may be used simultaneously. Rather than just state "mechanical and electronic raster scan," full details should be given in Block 10, "Remarks." The same is true if two or more different types of scan formats are used or selected by the operator.

(2) If the antenna, its main beam, and its sidelobes do not move, merely enter "Fixed" in line (a). If the antenna can only be set up in one orientation, such as vertical for a monopole whip antenna, the rest of the lines in Block 7 should be filled in with "NA." If the antenna mounting provides for various adjustments resulting in different antenna orientations, only lines (b) (3) and (c) (2) should be filled in with "NA." The question in lines (b) (1), (b) (2), and (c) (1) are still applicable and should be answered.

b. Vertical Scan. How the vertical portion of the scan, if any, is accomplished, should be entered on this line. If no vertical scanning is possible, the correct entry is "Fixed." If the antenna does not scan but can move or be set up in different vertical orientations, the entry should be "None" and lines (b) (1) and (b) (2) should be completed.

(1) Max Elev (Maximum Elevation) - This is the highest vertical angle to which the antenna can be elevated. If the antenna can scan or be set up to radiate/receive directly overhead, the entry on line (b) (1) would be "+90°." If the antenna can only scan up to the horizon, the entry would be "0°." As stated before, even if the antenna does not scan but can be changed in orientation, the maximum skyward adjustment should be stated in line (b) (1).

(2) Min Elev (Minimum Elevation - This is the lowest vertical angle to which the antenna can be depressed. It ranges from directly overhead (+90°) to straight down into the ground (-90°). Even if the antenna does not scan but can be set up or adjusted to different orientations, the minimum elevation should still be stated in line (b) (2).

(3) Scan Rate - Two different rates could be applicable. First is the number of degrees of vertical scan per second but only if the antenna does a horizontal raster scan in one second and drops down 1° after each sweep; then it is scanning vertically at 1°/second. The second rate required is the number of complete vertical scans per minute. If the same antenna completed a scan in 30 seconds, the vertical scan rate would be 2 scans/minute. Line (b) (3) should be divided in half, with the degrees/second figure listed first and the scans per minute figure last. A valid entry, for example, would be "1°/sec, 2 scans/min." If the antenna does not have a scan format, neither figure may be applicable. The scans per minute figure is applicable to all antennas with any vertical scan and must be listed. Any other pertinent scan rates should also be given in the "Remarks" section.

c. Horizontal Scan. How the horizontal portion of the scan, if any, is accomplished should be entered on this line. If no horizontal scanning is possible, the correct entry is "Fixed." If the antenna does not scan but can move or be set up on different horizontal orientations, the correct entry is "None." In this case, line (c) (1) should also be completed.

(1) Sector Scanned - This is the portion of a circle describing the antenna's scan or range of motion. An antenna that scans a complete circle has a "360°" sector scanned motion. If the antenna does not scan but its mounting allows it to move or be set up in different orientations, the maximum horizontal motion or adjustment should be entered.

(2) Scan Rate - Two different rates are required. First is the number of degrees of horizontal scan per second. An antenna that sweeps a complete circle once every second has a sweep rate of 360°/second. The second rate required is the number of horizontal scans completed per minute. It is not necessarily the "Sector Scanned" figure times the "degrees/second." If a significant portion of time is spent vertically scanning in between horizontal sweeps, the horizontal scan rate will be lower than this number would indicate. Line (c) (2) should be divided in half, with the degrees/second figure listed first, and scans per minute figure listed last. If an antenna does not have a scan format, neither figure may be applicable. The scans per minute figure is applicable to all antennas with any horizontal scan and must be listed.

Block 8. Gain

The gain to be provided is the "directivity" gain and must be given relative to an isotropic antenna. The units should be in dBi. If the antenna efficiency is known, it should be provided in the "Remarks" section.

Main Beam Gain. The main beam is described as that solid angle radiating away from the antenna in which the highest output power is transmitted or the maximum reception is possible. It encompasses the entire solid angle over which the output power is not less than 3 dB below the highest output power. For a dipole, this is a 360° x 180° sphere. A ground plane monopole's main beam is a 360° x 90° hemisphere. A high gain millimeter wave parabolic antenna may have a main beam of .25° x .25°. The main beam gain is the maximum gain within the main beam angle. Some antennas such as full earth coverage antennas may have complex patterns and no unique maximum. Such antennas must be explained in the "Remarks" section.

Sidelobe Gain. In addition to the main beam gain, most antennas also exhibit secondary areas of increased transmission or reception capability. These areas are called sidelobes. Sidelobes tend to fan out from the centerline of the main beam. The sidelobe closest to the main beam is called the 1st sidelobe. The farther away from the centerline of the main beam that a sidelobe forms, the less its gain. Usually, the 1st sidelobe has the most gain of any non main-beam antenna angle. Usually, antennas are designed to minimize sidelobe gains. Two items of information about the 1st sidelobe are required on line (b) of Block 8. The first is the gain of the sidelobe relative to the gain of the ideal isotropic antenna described above. The second is the angular position of the sidelobe relative to the main beam. The angular position of a 1st sidelobe that is at right angles to the main beam is 90°. A 1st sidelobe formed at the back of an antenna would have an angular position of 180°. For example, the entry on line (b) might be "10 dBi at 38°." If the antenna pattern is not symmetrical, the sidelobe gain and position in both the horizontal and vertical planes should be given.

There is one exception to the antenna sidelobe concept. This is an "omnidirectional" antenna. It is the 0 dBi spherical dipole antenna, or the 3 dBi hemispherical monopole antenna mounted on the ground. Its gain is uniform in every direction. Thus, there is virtually no sidelobe; the antenna is all main beam. For this case, and this case only, the correct entry on line (b) is "NA."

Quite often during antenna development, antenna radiation patterns are made. These are essentially graphic outlines of the main beam and all the sidelobes. If radiation patterns are available, they should be attached to the DD Form 1494. Radiation patterns on commercial antennas are often available from the equipment supplier.

Block 9. Beamwidth

The main beam is described as that solid angle radiating away from the antenna in which the highest output power is transmitted or the maximum reception is possible. Its beamwidth is the angle over which the antenna gain is not less than 3 dB below the main beam gain. A ground plane monopole's main beamwidth is a 360° x 90° hemisphere. A high-gain millimeter wave parabolic antenna may have a main beamwidth of .25° x .25°. When the angle is not centered on the main beam axis, the limits relative to the main beam axis should be stated in the "Remarks" section. For example, an ideal 1/4 wave dipole over an ideal ground plane would have a horizontal beamwidth of 360° and a vertical beamwidth of 39°. A remark would state that the vertical beamwidth limits were from 0° to 39°. While the energy being radiated or received by the antenna does not vary by more than 3 dB in the main beam, there is a distribution of gain within the beam. This distribution is referred to as the illumination factor. The illumination factor describes the geometric distribution followed by the energy in the main beam. It is expressed as "cosecant, cosecant-squared," etc. If the illumination factor of the antenna is known, it should be entered into Block 9 <u>in addition to</u> the numerical beamwidths called for. If the beam of antenna is omnidirectional, the correct entry in Block 9 is 360° x 90°, for a ground-mounted monopole antenna. The entry "omnidirectional" is not correct.

<u>Horizontal Beamwidth</u>. The angle in degrees between the 3 dB down points measured in a horizontal plane containing the main beam axis.

<u>Vertical Beamwidth</u>. The angle in degrees between the 3 dB down points measured in a vertical plane containing the main beam axis.

<u>Block 10. Remarks</u>

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block numbers. The security classification of any information contained in the "Remarks" block must be explicitly marked. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Classification (Bottom of Page)

Same as classification at top of page.

CLASSIFICATION	PAGE

ANTENNA EQUIPMENT CHARACTERISTICS

1. ☐ a. TRANSMITTING ☐ b. RECEIVING ☐ c. TRANSMITTING AND RECEIVING

2. NOMENCLATURE, MANUFACTURER'S MODEL NO.	3. MANUFACTURER'S NAME
4. FREQUENCY RANGE	5. TYPE
6. POLARIZATION	7. SCAN CHARACTERISTICS a. TYPE
8. GAIN	b. VERTICAL SCAN
a. MAIN BEAM	(1) Max Elev
	(2) Min Elev
b. 1st MAJOR SIDE LOBE	(3) Scan Rate
9. BEAMWIDTH	c. HORIZONTAL SCAN
a. HORIZONTAL	(1) Sector Scanned
	(2) Scan Rate
b. VERTICAL	d. SECTOR BLANKING *(x one)* ☐ (1) Yes ☐ (2) No
10. REMARKS	

CLASSIFICATION	

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Figure C-4, Form DD 1494, Page 4, Antenna Equipment Characteristics

PAGE 5 OF THE DD FORM 1494

NTIA General Information

Page 5 is a reformatting of some of the information already provided on Page 1. The DD Form 1494 is designed for use in two different arenas. One is the USMCEB Frequency Panel Allocation-to-Equipment or J/F 12 process; the other is the Interdepartment Radio Advisory Committee (IRAC) Spectrum Planning Subcommittee (SPS) system review process. Copies of Pages 2,3, and 4 are acceptable to both arenas. The nontechnical, planning, and deployment information on Page 1 is not universally accepted. Page 5 presents the information in a format acceptable to the SPS. Page 5 presents some of the same type of information in J/F 12 format, in addition to some specific information. Quite often, Page 1 is removed from the DD Form 1494 prior to its submission to the SPS arena. Page 5 is always filled out with information concerning the current and future stage of development. Questions concerning past development stages are always answered with an "NA."

Classification (Top of the Page)

See Paragraph 7.c. above.

Page Numbering

See Paragraph 7.b. above.

Block 1. Application Title

Enter the Government nomenclature of the equipment, or the manufacturer's name and model number, and a short descriptive title. The application title block must be identical to that listed in Block 1 of the DoD General Information page.

Block 2. System Nomenclature

The System Nomenclature is a title describing the RF system being allocated. It should be unique to this RF component of the overall platform or weapons system. The System Nomenclature block must be identical to that listed in Block 2 of the DoD General Information page.

Block 3. Stage of Allocation

Stages of allocation correspond to the stages of life cycle management. The amount and type of data required on the DD Form 1494 varies with the stage of allocation. The stage of allocation block must be identical to that listed in Block 3 of the DoD General Information page.

Block 4. Frequency Requirements

Two items of information must be listed in this block. They are the operational radio frequency band(s) and the emission designators. This block must be identical to Block 4 on the DoD General Information page.

Block 5. Purpose of System, Operational and System Concepts

This block should include the specific function the equipment is to perform, e.g., collect and disseminate meteorological data using satellite techniques; transmission of radar data for air traffic control; a remote control of ATC radars; provide for the transmission and reception of digital voice and data by means of LOS or troposcatter modes of propagation; provide navigation signals from which a broad spectrum of users are able to derive navigational data. This block should clearly indicate whether the equipment is for tactical, strategic, training, test, ECM, or nontactical use. Being overly descriptive is desired as opposed to entering too little information. Also, check the applicable wartime box.

Block 6. Information Transfer Requirements

This block can be "NA" for all radars, since no information is transferred by the radar. This block should contain a description of the types and forms of information to be transmitted or received. Examples of this are: analog voice, digital voice, multichannel PCM data, a tone, several coded-tone-sequences, standard video, etc. If several modulation techniques are to be employed, these should be listed. If processing prior to final modulation is to be performed such as spread-spectrum modulation or multiplexing, this should be described. In the case of direct-sequence spread spectrum, this must include the chip rate, data rate, and noise-equivalent occupied bandwidth. The description of radio frequency-hopping spread-spectrum must include: the number of channels, the hop rate, the total hopped-radio frequency range, and whether or not channels can be "locked out" or avoided. When the equipment will transmit or receive several channels of information that have been multiplexed together, the number of separated channels and the means of multiplexing (TDM, FDM, etc.) should be specified. If the equipment transmits on several RF channels simultaneously, this should be described and the total number of RF channels listed. All data rates listed should be maximum, (when available) not nominal values. In addition, if several discrete data rates are available, this should be indicated and the discrete data rates listed.

Block 7. Estimated Initial Cost of the System

Two items are required in this block: a dollar value, and what the dollar value represents. An example would be "10 million dollars for 100 Operational Systems." Entries such as, "$20M for Total R&D and Operational Procurement Costs" are also acceptable. The entry in this block is not used for accounting purposes nor is it subject to review. Rather, it is used to indicate the relative importance and complexity of the system being allocated.

Block 8. Target Date For

a. Application Approval This target date is that date by which approval of the DD Form 1494 is required. Generally, it is determined by the scheduled date for contract signing. Normally, all applications require approximately 3 to 12 months for processing. These requirements are dependent upon the quality of the submission and the possible impact of the system on the radio frequency spectrum. The target date should postdate the date of application reception at the DON by at least this time period if it is to be approved on time. In all cases, the target date must precede the proposed Target Starting Date listed in Page 1, Block 5.

b. System Activation The system activation date is that date when the system will emit and/or receive in the stage being allocated. This date must postdate the application approval date.

c. System Termination The system termination date is that date when the current phase of the life-cycle model is scheduled to end. For a Stage 2 application, the date entered is the date when the system is scheduled to enter Stage 3. This date may be an estimate. For a Stage 4 application, "NAvail" may be entered if the system is expected to be operational for a long time.

Block 9. System Relationship and Essentiality

This block should identify required interfaces with other systems or platforms and provide a brief statement of how these interfaces are achieved. For example, a tactical radio might interface with the local telephone system through a Radio-Wire-Integration (RWI) control device. Such an interface, if planned, should be explained in this block. Include justification for the system.

Block 10. Replacement Information

Enter the information in this block if the equipment will replace any existing equipment, either directly or indirectly. The information is used to determine if the equipment is updating an existing system, even a non-RF system such as a telephone, or if it is a totally new development fulfilling a previously nonexistent function. No action to cancel radio frequency assignments or allocations will be taken based on the information provided.

Block 11. Related Analysis and/or Test Data

All reports related to the EMC of the equipment should be referenced. This list of reports should include any EMC studies, analyses, predictions, and test results. In addition, any reports regarding radio frequency assignment problems or algorithms should be included. The reference should include the report number, the agency or contractor responsible for the report, title, the date of its publication, classification, and the downgrading (if classified). Reports currently being accomplished but not yet published should be referenced.

Block 12. Number of Mobile Units

Enter the number of units capable of operating from different locations only for systems in the mobile services.

Block 13. Geographical Area For

List the location of area of operations for each stage of the subject equipment. Since Stage 1, "Conceptual," generally does not involve actual radiating hardware, there is no Stage 1 provision in this block. In Stage 2, the number of locations for all experimentation is generally quite small and actual sites can be listed by name. Since a DoD radio frequency allocation is the contractor's authorization to construct equipment, it is important that the contractor's plant be listed as a site. In Stage 3, either the sites can continue to be individually listed, or a generic description, such as "U.S. military test ranges in the US&P," can be substituted. This generic description should not be too general in nature. It is not possible to grant a Stage 3 radio frequency allocation for operations in the entire "US&P", since authorization is being requested for use anywhere, even New York or Los Angeles. The same situation exists with the use of an overseas theater of operation. Thus, the entry of "Europe," or "Pacific" without further details will needlessly slow down and delay processing of the allocation application. In Stage 4, the locations of operations should be as specific as possible. For some fixed microwave equipment, it may be possible to list the site location by latitude and longitude. In many cases, only the countries or oceans to which the equipment will be deployed are known. Listing just the area of operation (e.g., Europe) is overly general and is not acceptable. "NA" should be entered for all past stages. An operational application would only have a location for Stage 4. Stages 2 and 3 would be marked "NA."

Block 14. Line Diagram

The line diagram should not be drawn in this block. An acceptable entry in this block is "See page ___ ." A separate sheet with the line diagram and the appropriate security classification would then be provided for all allocation applications. The line diagram should show all the RF links of the overall system or platform and how they interrelate. All RF links should be labeled as to directions of transmission and radio frequency range. A detailed breakdown of internal components, i.e., a block diagram, is not desired. Multiple diagrams showing different interconnections or models are encouraged when these diagrams will aid in the understanding of a complex system.

Block 15. Space Systems

Enter the page number of the space system data. Attach as another page, the space system data as described in the NTIA Manual, Paragraph 10.7.3.

Block 16. Type of Service(s) for Stage 4

The type of service should not be confused with the station class (see the next paragraph.) The services being referred to in this block are the ITU-recognized services as they appear in the national and international allocation tables. Examples are: Radiolocation, Aeronautical Radionavigation , Broadcast Satellite, Fixed, Mobile, Aeronautical Radionavigation Satellite, etc. (See Annex G.) If more than one type is applicable, list all that apply. Thus, a radio might be used while in motion on the ground (Mobile), might also be permanently installed and used to communicate with other fixed radios (Fixed), or might be installed in aircraft (Aeronautical Mobile). All three types of service should be listed. If the system being allocated does not operate in a band allocated to this type of service (or one of its types of service when multifunction equipment is involved), an explanation must be included in Block 18. This explanation must be based on functional and operational requirements. Explanations involving cost, availability of commercial equipment, etc. are not acceptable. Radio frequency allocations will not be issued to an "out-of-band" system without a sufficiently valid explanation.

Block 17. Station Class(es) for Stage 4

This block refers to the station classes if the system will reach Stage 4, as defined in Annex G. Only the symbols listed there are acceptable as entries in this block. Several different station classes may describe the equipment. In this case, all the descriptive station class symbols should be listed. Multiple code listings will almost always be the case when the equipment accomplishes more than a single function. The station class is the equipment purpose and function, and must fall within those classes related to the services listed in Block 16, Type of Service. The following rules should be considered when determining station class applicability:

a. All equipment, fixed or mobile, that transmits to a mobile receiver is considered to be in the mobile service.

b. No general station classes exist for "transportable" equipment. Both "fixed" and "mobile" station classes applicable to the equipment should be listed in this block.

c. Several types of systems have no station class such as: Electronic Warfare and Simulators. For the station class of these systems, write NA ("EW") or NA ("Simulator").

d. If the system is for experimentation only, and is not intended for Stage 4 operation, enter "NA".

Block 18. Remarks

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block number. The security classification of any information contained in the "Remarks" block must be explicitly marked. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Downgrading Instructions

Insert classification downgrading instructions as appropriate.

Classification (Bottom of Page)

Same as classification at top of page.

APPLICATION FOR SPECTRUM REVIEW	CLASSIFICATION	PAGE

NTIA GENERAL INFORMATION

1. APPLICATION TITLE

2. SYSTEM NOMENCLATURE

3. STAGE OF ALLOCATION *(x one)*
   - ☐ a. STAGE 1 CONCEPTUAL
   - ☐ b. STAGE 2 EXPERIMENTAL
   - ☐ c. STAGE 3 DEVELOPMENTAL
   - ☐ d. STAGE 4 OPERATIONAL

4. FREQUENCY REQUIREMENTS
   - a. FREQUENCY(IES)
   - b. EMISSION DESIGNATOR(S)

5. PURPOSE OF SYSTEM, OPERATIONAL AND SYSTEM CONCEPTS — (WARTIME USE) *(x one)* ☐ a. YES ☐ b. NO

6. INFORMATION TRANSFER REQUIREMENTS

7. ESTIMATED INITIAL COST OF THE SYSTEM

8. TARGET DATE FOR

a. APPLICATION APPROVAL	b. SYSTEM ACTIVATION	c. SYSTEM TERMINATION

9. SYSTEM RELATIONSHIP AND ESSENTIALITY

10. REPLACEMENT INFORMATION

11. RELATED ANALYSIS AND/OR TEST DATA

12. NUMBER OF MOBILE UNITS

13. GEOGRAPHICAL AREA FOR
   - a. STAGE 2
   - b. STAGE 3
   - c. STAGE 4

14. LINE DIAGRAM See page(s)	15. SPACE SYSTEMS See page(s)
16. TYPE OF SERVICE(S) FOR STAGE 4	17. STATION CLASS(ES) FOR STAGE 4

18. REMARKS

DOWNGRADING INSTRUCTIONS	CLASSIFICATION	

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Figure C-5, Form DD 1494, Page 5, NTIA General information

PAGE 6 OF THE DD FORM 1494

Foreign Coordination General Information

Page 6 is a reformatting of some of the information already provided on Page 1. It is intended for equipment that will be operated outside the US&P. Foreign disclosure is required to coordinate and obtain radio frequency spectrum support from those countries where this equipment may operate. Do not complete this page unless you are preparing a foreign coordination version of the DD Form 1494. Insert the information in "Notes" on the back of the Foreign Coordination General Information page. A foreign coordination version may be submitted at Stage 2 and is required at Stage 3 even if the system will not be operated outside the US&P until Stage 4.

Classification (Top of the Page)

See Paragraph 7.c. above.

Page Numbering

See Paragraph 7.b. above.

Block 1. Application Title

Enter the Government nomenclature of the equipment, or the manufacturer's name and model number, and a short descriptive title. This entry must match that of Block 1 on the DoD General Information page.

Block 2. System Nomenclature

The System Nomenclature is a title describing RF system being allocated. It should match that of Block 2 on the DoD General Information page.

Block 3. Stage of Allocation

Stages of allocation correspond to the stages of life cycle management. This entry must match that of Block 3 on the DoD General Information page.

Block 4. Frequency Requirements

Two items of information must be listed in this block. The entries must match those of Block 4 on the DoD General Information page, unless the data are not releasable.

Block 5. Proposed Operating Location Outside US&P

Enter those Host Nations locations or areas of use. Provide geographical coordinates in degrees, minutes, and seconds, if known.

Block 6. Purpose of System, Operational and System Concepts

This block should include the specific function the equipment is to perform, e.g., collect and disseminate meteorological data using satellite techniques; transmission of radar data for air traffic control; a remote control of ATC radars; provide for the transmission and reception of digital voice and data by means of LOS or troposcatter modes of propagation; provide navigation signals from which a broad spectrum of users are able to derive navigational data. This block should clearly indicate whether the equipment is for tactical, strategic, training, test, EMC, or nontactical use. Being overly descriptive is desired as opposed to entering too little information.

Block 7. Information Transfer Requirements

This block can be "NA" for all radars. This block should contain a description of the types and forms of information to be transmitted or received. Examples of this are: analog voice, digital voice, multichannel PCM data, a tone, several coded-tone-sequences, standard video, etc. If several modulation techniques are to be employed, these should be listed. If processing prior to final modulation is to be performed such as spread-spectrum modulation or multiplexing, this should be described. In the case of direct-sequence spread-spectrum, this must include the chip rate, and noise-equivalent occupied bandwidth. The description of radio frequency-hopping spread-spectrum must include: the number of channels, the hop rate, the total hopped-radio frequency range, and whether or not channels can be "locked out" or avoided. When the equipment will transmit or receive several channels of information that have been multiplexed together, the number of separated channels and the means of multiplexing (TDM, FDM, etc.) should be specified. If the equipment transmits on several RF channels simultaneously, this should be described and the total number of RF channels listed. All data rates listed should be maximum, (when available) not nominal values. In addition, if several discrete data rates are available, this should be indicated and the discrete data rates listed.

Block 8. Number of Units Operating Simultaneously in the Same Environment

Enter the maximum number of the equipments that will be operating simultaneously in the same environment in Stage 4.

Block 9. Replacement Information

Enter the information in this block if the equipment will replace any existing equipment, either directly or indirectly. The information is used to determine if the equipment is updating an existing system, even a non-RF system such as a telephone, or if it is a totally new development fulfilling a previously nonexistent function. No action to cancel radio frequency assignments or allocations will be taken based on the information provided.

Block 10. Line Diagram

The line diagram should not be drawn in this block. An acceptable entry in this block is "See page ___." A separate sheet with the line diagram and the appropriate security classification would then be provided for all allocation applications. The line diagrams should show all the RF links of the overall system or platform and how they interrelate. All RF links should be labeled as to directions of transmission and radio frequency range. A detailed breakdown of internal components, i.e., a block diagram, is not desired. Multiple diagrams showing different interconnections or models are encouraged when these diagrams will aid in the understanding of a complex system.

Block 11. Space System

Enter the page number of the space system data. Attach as another page, the space system data as described in the NTIA Manual, Paragraph 10.7.3.

Block 12. Projected Operational Deployment Date

Enter the date the equipment is to become operational in its field location.

Block 13. Remarks

This block may be used as a continuation of any of the preceding blocks. The continued block or blocks should be identified by their block number. The security classification of any information contained in the "Remarks" block must be explicitly marked. Any additional information that clarifies the function or operation of the equipment may be entered in this block.

Downgrading Instructions

Insert classification downgrading instructions as appropriate.

Classification (Bottom of Page)

Same as classification at top of page.

APPLICATION FOR FOREIGN SPECTRUM SUPPORT	CLASSIFICATION	PAGE

FOREIGN COORDINATION GENERAL INFORMATION

1. APPLICATION TITLE

2. SYSTEM NOMENCLATURE

3. STAGE OF ALLOCATION *(X one)*
   - ☐ a. STAGE 1 CONCEPTUAL
   - ☐ b. STAGE 2 EXPERIMENTAL
   - ☐ c. STAGE 3 DEVELOPMENTAL
   - ☐ d. STAGE 4 OPERATIONAL

4. FREQUENCY REQUIREMENTS
   a. FREQUENCY(IES)
   b. EMISSION DESIGNATOR(S)

5. PROPOSED OPERATING LOCATIONS OUTSIDE US&P

6. PURPOSE OF SYSTEM, OPERATIONAL AND SYSTEM CONCEPTS

7. INFORMATION TRANSFER REQUIREMENTS

8. NUMBER OF UNITS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT

9. REPLACEMENT INFORMATION

10. LINE DIAGRAM See page(s)	11. SPACE SYSTEMS See page(s)

12. PROJECTED OPERATIONAL DEPLOYMENT DATE

13. REMARKS

DOWNGRADING INSTRUCTIONS	CLASSIFICATION	

DD Form 1494, FEB 87 S/N 0102-LF-001-4941

Figure C-6, Form DD 1494, Page 6, Foreign Coordination General information

ANNEX D

FREQUENCY ASSIGNMENT

D101. POLICY

a. Frequency assignment is the process of authorizing a system or equipment to operate on a discrete frequency(ies) and within a specified set of constraints such as power, emission bandwidth, location of antennas, and operating time of day. Authority for the use of radio frequencies by Navy and Marine Corps activities within the US&P is obtained from the Administrator, NTIA (US&P is defined as the 50 States and the District of Columbia, the Commonwealth of Puerto Rico, and the following territories and possessions: Navassa Island, Culebra, Mona, Vieques, Quita Sueno Bank, Roncador Bank, Serrana Bank, Serranilla Bank, Virgin Islands, Baker Island, Guam, Howland Island, Jarvis Island, Johnston Island, Kingman Reef, Midway, Mariana Islands, Palmyra Island, American Samoa, and Wake Island.)

b. The CNO establishes overall policy for spectrum management within the DON. Authority for the use of radio frequencies by Navy and Marine Corps activities within the area of responsibility of a Unified or Specified Commander is obtained from the JCS through DON. The NAVEMSCEN authorizes frequency assignments ensuring conformance, compliance, and compatibility with departmental, national and international rules, regulations and procedures.

c. All Naval and Marine Corps commands, organizations, and activities are required to follow the spectrum management policies and procedures promulgated by COMNAVCOMTELCOM. Within Unified and Specified Command, local directives may supplement or modify the procedures contained in this document.

d. The transfer of frequency assignment data between organizations has in the past been done primarily via AUTODIN message using the SFAF. Whenever practical organizations are encouraged to take advantage of computer processing and transfer data via dial up modem or, where time permits, transfer data via floppy or hard disk. These procedures are designed to reduce the amount of FRRS message traffic using the AUTODIN system.

(1) CONCEPT OF OPERATIONS. This Concept of Operation within the NAVEMSCEN is established to standardize the flow of data between activities, monitor the status of the activity, and assure that existing and planned automation capabilities are utilized to the maximum extent possible.

(2) GOAL. The goal is to transition from a mini-computer operation at NAVEMSCEN to one that is PC-oriented. The primary goal being to utilize microcomputers at all locations where there is a need for management of either allocations or assignments, or use of radio frequencies in satisfying an activities mission. The planned integration of individual data bases associated with these needs into a single relational entity in the microcomputer, will permit the achievement of source-data automation of the respective functions. All users will have access to: authorized equipment allocations, authorized frequency assignments, engineering analysis programs and other software tools necessary to effectively monitor, measure, and control the radio spectrum assets.

(3) OBJECTIVE. The objective for each spectrum management function is automatic data entry, editing, analysis, and elimination, insofar as possible, of the exchange of hardcopy data.

(4) APPROACH. Desktop III UNISYS or compatible microcomputers are to be utilized for both generation and acceptance of data, including radio frequency transactions and frequency usage data.

(5) FREQUENCY PROPOSAL/ASSIGNMENTS.

(a) Frequency proposal transactions at the field level will be generated on a UNISYS microcomputer (or Compatible PC) using the FACTS/ASPECTS software.

(b) Following generation and edit for

accuracy, the data will be output to a 5 1/4" diskette and forwarded to the appropriate regional frequency management office. The diskette(s) will be physically labelled to identify classification of the contents.

(c) The regional office will edit and/or modify as necessary, consolidating activity transactions as appropriate to minimize the disk storage needed. Transactions will be forwarded to NAVEMSCEN either electronically, using DDN, or by diskette.

(d) NAVEMSCEN will secure national approval and then return the approved assignment(s) to the regional office by DDN/Diskette, for distribution to the cognizant field office(s).

(6) FIVE-YEAR REVIEW.

(a) Frequencies due for a five-year review will be forwarded periodically to the Frequency Management Regional Offices on 5 1/4" diskette(s) for distribution to the appropriate field activities. (This operation will be eliminated when activities have the necessary computer capability to determine this locally). The receiving activity will utilize FACTS/ASPECTS software to call-up the individual assignments, modifying them as necessary to correct indicated deficiencies and to satisfy the SFAF edit checks.

(b) Following necessary modifications, the transactions will be returned to the Frequency Management Regional Office for processing to NAVEMSCEN in the same manner proposals are forwarded as described above.

(c) The Regional Office will forward the transactions to NAVEMSCEN via DDN or diskette for appropriate processing to NTIA.

(d) Following approval and recording in the NTIA data base, notification on diskette will be forwarded to the Regional Office for notification to the respective activities.

(7) ALLOCATIONS.

(a) Requests for equipment allocation will be generated at the field level using ASPECTS software for DD Form 1494 preparation on an IBM-compatible computer.

(b) Following generation and edit for accuracy, the data will be output to a 5 1/4" diskette and forwarded to the CNO (OP-940T) for processing to NAVEMSCEN. The diskette(s) will be physically labelled to identify the contents by DD Form 1494/equipment number(s) and the highest security classification of the contents.

(c) NAVEMSCEN will secure national approval or comments and return the completed action on diskette to CNO for distribution to the cognizant field office(s).

(8) STANDARD OPERATING PROCEDURES.

(a) All NAVY activities having access to a microcomputer with FACTS/ASPECTS software will be expected to maintain their own local computerized data base of authorized assignments, and will use DDN/Diskettes as the medium for transmission or receipt of SFAF data.

(b) All frequency proposal/assignment transactions will be initiated in SFAF format utilizing the FACTS/ASPECTS software. The medium for exchange of this data with other activities will be via 5 1/4" diskettes.

(c) All activities will be responsible for conducting a review of authorized assignments within 5-years of authorization, and will confirm conduct of that review by initiation of the appropriate SFAF formatted transaction for forwarding on diskette(s) as described above.

(d) Periodically, NAVEMSCEN will initiate action to extract listings of assignment records that have <u>not</u> been reviewed within the required 5-year period, and will forward those listings to the Regional Office on diskette for appropriate action with the using activity.

(e) The exchange of frequency transactions via AUTODIN will be permitted only for small users having less than 10 discrete frequencies authorized. Those users will normally receive notice of frequencies due for review from NAVEMSCEN or the Regional Office, at least 6 months prior to the required review date.

(f) All NAVY activities having access to a microcomputer with ASPECTS software will be expected to maintain their own local computerized data base of allocated equipments. Diskettes will be used as the medium both for submitting equipment allocations DD Form 1494 data and for receiving approvals from CNO.

(g) All equipment allocation requests will be initiated in DD Form 1494 format utilizing the ASPECTS software. The medium for coordination of this data with other activities will be via 5 1/4" DDN/Diskettes.

(h) The exchange of DD Form 1494 requests in hardcopy will not be permitted except in those rare instances where users do not have access to a compatible microcomputer. At activities where the DD Forms 1494 are normally prepared by a contractor, the ASPECTS software will be made available by the sponsoring activity for use by the contractor as appropriate.

(9) <u>PREPARATION OF FREQUENCY ACTION REQUESTS</u>. A standard, <u>**vertically formatted**</u> message must be submitted via the SFAF format IAW applicable instructions contained herein; however, the major command frequency management offices are now required to ensure SFAF Items 005, 102, 110, 144, all 200 Items (current, as they want them), 701, 702 and 803 are completed as follows:

(9) PREPARATION OF FREQUENCY ACTION REQUESTS (contd).

1 SFAF Item 005. No change.

2 SFAF Item 010. No change. However, the copy function "C" must be used judiciously and with careful thought to "accurately" create frequency actions. In addition to the minimum required SFAF Items for a copy-type of action (005, 010, 102, and 144), the following items must now be included: 110, 701, 702, 803.

3 SFAF Item 020. Optional but highly recommended. Use to indicate the requestor's message DTG or letter reference that initiated the frequency action request. Entry will help correlate for the requestor the FRRS notification message with their frequency action request. Entry will appear in only the FRRS notification message and not in the GMF or FRRS master files.

4 SFAF Item 102. For new frequency proposals, this item shall be assigned a Navy serial from blocks of serial numbers allocated from NAVEMSCEN. Modifications and deletions will continue to reflect the assigned serial number in the FRRS. For multiple 102 entries, they shall be listed vertically rather than horizontally. The following are the assigned blocks of serial numbers:

JFMO LANT	NYY7000 - NYY7999
NFCWUS	NYY8000 - NYY8999
CINCPACFLT	NYY9000 - NYY9999

5 SFAF Item 110. No change for single item entries. Multiple 110 item entries shall be listed vertically rather than horizontally. Following is an example:

110A. M244.575
110B. M303.89
110C. M399.1

6 SFAF Item 144. As reflected in the FRRS record. Multiple entries shall be listed vertically to correspond to previous multiple item entries.

7 SFAF Item 701. Entry shall reflect a three digit number identifying the appropriate NAVEMSCEN frequency action officer (FAO) for the action. A list depicting FAOs and band assignments/responsibilities is listed below.

8 SFAF Item 702. Control/request number assigned by the major command FMOs. This will not be changed by NAVEMSCEN.

9 SFAF Item 803. No change.

(10) MESSAGE ADDRESSING. Continue to address your messages to NAVEMSCEN (as appropriate) and appropriate info addressees; however, you must now include "FRRS WASHINGTON DC//N//" as an additional info addressee. This will enhance computer interactions between NAVEMSCEN and the FRRS.

(11) FREQUENCY ACTION APPROVALS/NOTIFICATIONS. The FRRS shall automatically notify you of completed actions via an AUTODIN message.

(12) NAVEMSCEN FREQUENCY ACTION OFFICER (FAO) AREA OF RESPONSIBILITIES.

D102. PROCEDURES

BELOW 30 MHz BRANCH

AREAS OF RESPONSIBILITY	FAO CODE
LANT US&P/OUS&P /Europe	312
5-Year Review	316/315
MARS	311
Flimsy - All (AR, AF, DISA)	311
PAC US&P/OUS&P AUS/J/DGA/PHL	313
Ship Visits	314
US&P Deletions	316
87 MWARC Implementation	313/311
88 RARC/BC (K1605-1705)	31
HF Re-accommodation RES 8	31
WARC-79	31
Chirpsounder	313
All temps 90 days or less	312
AP26 "OR" Realignment	315
**All Other Areas	31

ABOVE 30 MHz BRANCH

AREA OF RESPONSIBILITY	FAO CODE
M30-107.99	323
M108-199.99	321
M225-399.95	323
M406-420	321
M30-107.99	323
M108-199.99	321
M225-399.95	323
M406-420	321
M420-450	323
M463-935	322
M941-944	321
M960-1400	322
M1435-1535	323
M1680-1850	321
M2200-2390	323
M2700-4400	322
M4400-4990	321
M5000-5925	322
M7125-8400	321
M8500-10550	322
G13-400	321
Radiolocation, Radionavigation	322
ECM, JTIDS	322/323
Microwave, Tropo, Pt-Pt sys	321/322
Satellite Communications	321
Telemetry, Telecommand	323
LMR,Trunking,etc.	321
Spread Spectrum Systems	323/322
Renewals	Applicable FAO
5-Year Reviews, Deletions	Applicable FAO
**All Other Areas	32

a. Requests by Navy or Marine Corps units for authorization to operate any radiating device are submitted as follows:

(1) Requests for frequency support managed by the MCEB Frequency Panel (FP) (paragraph 211) will be made via frequency management channels to the JFP and to the Unified or Specified Command, if applicable. The commander will forward the request to the FP.

(2) Requests for frequency support within the US&P (other than that managed by the MCEB FP) will be forwarded through frequency management channels via the DON AFC to NAVEMSCEN.

(3) Request for frequency support outside the US&P (other than that managed by the MCEB FP) will be forwarded through frequency management channels via the DON AFC to the Unified or Specified Commander.

(4) All requests for frequencies to meet routine, foreseeable requirements should be submitted in the prescribed SFAF format as outlined in paragraph 5. Submissions should be made at least 90 days before commencement of the requirement(s) when the frequency will be used within the US&P, and at least 120 days when the frequency will be used outside the US&P.

(5) Requests for renewal of temporary assignments should be treated the same as a new assignment and submitted in the SFAF at least 90 days (120 days outside US&P) before expiration of the temporary assignment (SFAF item 141).

(6) Administrative changes may be submitted via the chain of command at any time.

b. Each frequency assignment is to be kept current and updated whenever any assignment parameters change or be deleted when the assignment is no longer required. As a minimum, each assignment will be reviewed at least once every five years. The objectives of the Five-Year Review Program are to maintain an up-to-date FRRS central data base which supports the needs of frequency management offices and EMC analysis activities throughout the DoD. Frequency assignment records will be reviewed to determine if frequency assignments:

(1) Are still required for continued operations for the purpose stated in their justification.

(2) Are still qualified for authorization under the provisions of the rules and regulations contained in this NTP and other national or international directives.

The review of a record can be started by the using activity on its own, or it may request through frequency management channels the use of the automated record review capability provided by ECAC. ECAC has the capability to select records by the date due for review (SFAF item 142) or by the expiration date (SFAF item 141), validate the data in the record to determine if the record meets all current DoD and US national requirements, format the record (with validation checks) in an AUTODIN message or on a floppy (or hard) disk, and forward the records to the using activity or other appropriate organization. The using organization will review all data in the record and submit an appropriate frequency assignment proposal to update or delete the record in the SFAF.

D103. COORDINATION

a. Requests for frequencies to be used within the area of cognizance of an Area Frequency Coordinator (AFC) shall include comments and/or concurrence from the appropriate AFC.

b. Tenant activities will coordinate frequencies with the installation frequency manager and shall ensure that the correct entry is made in SFAF item 206 and include any comments and/or concurrences from the installation frequency manager in SFAF item 801. In all instances where the assignment is not located on the base where the unit is usually stationed the unit will include in item 801 a statement that the frequency assignment action has been "coordinated with (name) at (installation) (phone number)".

c. When a shore-based activity in the CONUS is required to operate in local civil police, fire, or emergency nets, the request shall list the specific frequency to be used and shall include a letter of concurrence from the local civil agency involved (passed separately when the frequency request is submitted by message).

d. When a frequency must be assigned to a station located on any land or reservation under the jurisdiction of the Forest Service, Department of Agriculture, or the Bureau of Land Management of Interior, the date of notification for permission to make the installation on the subject land or reservation and the land office from which the notification was received must be included in Items 502 and 801 of the request for frequency assignment.

e. Frequencies are assigned for use at specific locations or in specific areas only. Mobile units such as aircraft squadrons, SEAL teams, etc., must not plan on using frequencies assigned to their home base at the location to which they relocated without prior approval of the appropriate NAFC or NAVEMSCEN. If relocating to an Army or Air Force Base, extensive coordination must be affected by the NAFC with the Army or Air Force to prevent harmful interference to either user. Ships on deployment must ensure that specific authorization for all frequencies used in foreign ports is obtained. This includes portable radios such as hand-held walkie-talkies.

D104. <u>RADIO FREQUENCY ASSIGNMENT ACTIONS</u>

a. Requests for frequency assignment support is done in the SFAF as defined in the rest of this Annex. A quick reference guide to the SFAF is at Annex D-1. The following general guidelines apply in preparing frequency assignment proposals:

(1) Determine the type of action being requested (new, modification, renewal, or deletion) and ensure that all mandatory items are completed. See Annex D-2 through D-13 for a list of mandatory items required for the following categories of assignments:

(a) Abbreviated request Annex D-2

(b) Frequencies less than 30 MHz Annex D-3

(2) In addition to the minimum required items, enter data in all items where the data is known. This additional data assists in resolving interference problems, coordinating the assignment, and routing or selecting records for distribution.

(3) The standardization of data entries is important in managing the frequency spectrum. Many FRRS database products provided to operational users by DoD ECAC select on SFAF 200 series items or location data in the record. If data is missing or entered incorrectly, then a record may be omitted from an organizations data base product. In other instances, data base products are sorted by location and frequency. Errors in location fields or inconsistent entry of data can cause records to not be grouped correctly. An individual may then overlook or not find a particular record when using the

data base product. NAVEMSCEN, USAF, CINCPAC and other organizations have published standard data entries for various 200 series data items. Use the standard entry, if known. If an entry is not published, but has been used before, continue to use the same entry. If an entry is not published, and has not been used before, select your standard entry and then continue to use it in future frequency assignment actions. When assignments are located on another service's installation, it is important, as part of the coordination process, to obtain and enter the correct installation frequency manager's organization designation codes in SFAF item 206. This ensures that the record will appear in the next issue of the installation frequency managers data base product.

(4) Installation frequency managers and DON Area Frequency Coordinators (AFC) are available to assist using activities in the preparation of frequency assignment proposals.

b. A standard formatted message must be submitted to initiate a frequency assignment action. There are seven standard types of action used to process FRRS assignment transactions. They are as follows:

(1) New. For proposal(s)/assignment(s).

(2) Copy. To prevent duplication of data.

(3) Modification. To change existing information (includes five-year reviews).

(4) Deletion. To remove assignment(s) no longer needed.

(5) Renewal. Used to extend the expiration date (Item 141) of a TEMPORARY assignment.

(6) Notification. Brings frequency under group assignment into use.

(7) Administrative Modification. To make administrative changes.

c. More than one type of action can be included in a multiple-part FRRS message. Each type of message is described in the paragraphs below.

D105. <u>NEW</u>

a. There are several ways to create new records. A request for a new frequency assignment must contain the information required by the SFAF, plus additional information necessary to provide a clear and accurate description of the requirement. A request for radio frequencies requires substantial leadtime. NAVEMSCEN normally must have at least 90 days leadtime to process requests. Following is an example of a message creating a typical new FRRS record (See SFAF in paragraph 11 for details of item numbers):

005. U	204. NCWP	400. PAC
010. N	205. WINGSPAC	401. AIRCRAFT
102. N918000	206. NASAGANA	440. G,R-1051/URR
110. K4740.5	207. PATWING1DETAGANA	443. 1878
113. FA	208. N70243	500. E029
114. 3K00J3E	209. JPAC/JGUM	502. A/G/A ASW COMMS
115. K1	300. GUM	701. 315
130. 1	301. BARRIGADA	702. NCWP 91-236
140. 920227	303. 132843N1444850E	705. MISC,OR
144. O	340. G,AN/FRT-84	707. 325-11
145. Y	343. 2032/2	
200. USNAVY	362. ND	
201. CINCPAC	363. V	
202. PACFLT		

b. This is an example of a single message creating a single FRRS record. It is also possible to create multiple records using one message part. This is accomplished through the use of multiple record identifiers commonly referred to as the ABC concept. In the above example, two records could have been created by marking the first record "A" (i.e., 102A. N91800, 110A. K4740.5, etc.) and inserting 102B. N881239, and 110B. K7263.1. This assumes that all the information in the other item numbers applies to the second record. If not, then insert an "A" item number for the correct information in each case. It is possible to create multiple records in this fashion using all 26 letters of the alphabet. If more than 26 records are required then "AA, AB, AC....BA, BB, BC," and so on may be used.

D106. COPY

a. The COPY type of action can be used to prevent unnecessary duplication of identical data. It is normally used to copy a record formatted in a previous part of the same message and use that record as a basis to create one or more new records. Items required to copy a record are: 005, 010, 020, 102, 110, 144, 300, 301, (400/401 for downlink receivers) plus the items to be modified or deleted.

b. Once a record is completely formatted in a message, it can become the basic record and then parts of it can be copied during the construction of other frequency assignments. In subsequent message parts, item 010 Type of Action will contain a "C" followed by the agency serial number of the basic record being copied (e.g., 010. C(N881239)).

D107. MODIFICATIONS

a. An assignment modification is the addition, substitution, or removal of any item in an existing frequency assignment except serial number, frequency, and transmitter state/country. These changes require a new assignment request and deletion of the existing assignment. A five-year review is processed as a modification. It is used to review and update an existing frequency assignment. Modification requests must arrive at the NAVEMSCEN at least 120 days before the required date or the review date. This format should be followed when modifying frequency assignments. When an item is to be modified, include the item number (include slant bar delimiters, 113/2, 114/3, 503/2, etc.) and the new data. Items 005, 010, 020, 102, 110, 144, 300, 301, 502, 701, 702, 803 and any items to be added, changed, or deleted will be included. All items will be listed in the same order as they appear in the SFAF. See Annex D-11 for the requirements for a modification proposal.

b. Whenever a frequency assignment record is modified or renewed (item 010 = M or R) the entire record is reviewed and updated. Record reviews should be done by the organization which is operating the equipment. **ALL data items MUST be checked!** The following checklist will assist users in performing frequency assignment record reviews:

(1) Has the old equipment, antenna, etc., been replaced with different equipment? (SFAF Items 340, 354, 355, 440, 454, 455).

(2) Has the equipment been moved/antenna location changed? (Items 303, 358, 359, 360, 362, 363, 403, 458, 459, 460, 462, 463).

(3) Has the area of operation changed? (Items 306, 406, 530, 531, 711).

(4) Are the 200 series Items current and reflect the correct organizational standard data entry? (Items 200-209) (This is especially important for the automatic routing of messages to those organizations in the frequency management chain and the selecting of records to be included in the installation frequency managers data base).

(5) Are all the technical characteristics for the assignment still the same? (Items 114, 115, 346, 347, 357, 457).

(6) Has the purpose for which the assignment is used changed? (Items 502, 705). Does the new purpose change items 113, 306, 406, etc.?

(7) Are the appropriate coordination documents included in the transaction being prepared? (Item 520, 801).

(8) For US&P assignments, are the notes still appropriate/reflect current requirements? (Items 500, 501).

D108. <u>DELETION</u>

Sometimes a using activity will no longer need a frequency that has been assigned. Under these circumstances, the activity will submit a deletion message. When no longer required, units will submit deletion requests of authorized frequencies through frequency management channels. Do not submit a deletion request if a frequency assignment is to expire within 120 days of when the frequency requirement is no longer required. See Annex D-12 for the requirements of a deletion proposal.

D109. <u>RENEWAL (Temporary Assignments)</u>

a. Renewals are used to extend a temporary frequency assignment and to change SFAF item 141 (expiration date). Renewal requests should arrive not later than 90 days before the expiration date. Otherwise, a new proposal must be submitted if the proper leadtime is not provided.

b. Using activities will submit requests to support temporary and exercise requirements by message, in the abbreviated SFAF format, through normal frequency management channels. This format is used for frequency requirements that do not exceed 90 days. Minimum leadtime is 60 days.

D110. <u>NOTIFICATION</u>

This type of action is used to notify IRAC that a frequency authorized under a group assignment is being brought into use. This action is based on the authority granted previously by IRAC and stored in the Government Master File (GMF). This type of action is formatted the same as NEW type of action, except that the Agency Serial Number of the group assignment record stored in the GMF must be entered in item 105 and enter "F" in item 010.

D111. <u>ADMINISTRATIVE MODIFICATION</u>

This action is used to make changes in the three general categories: typographical, administrative (200 and 502 series), and modifications that are required to comply with international, national, or DoD rules and regulations. In all cases the assignment authority will be notified of all administrative modifications initiated by the frequency management office having cognizance over the assignment.

D112. <u>FIVE-YEAR REVIEW</u>

A five-year review of frequency assignments is necessary to validate continued requirement for the frequency and all data contained therein. If requirement is no longer valid, the frequency assignment will be deleted. If the requirement is validated, then all assignment data must be validated and updated. The five-year review conducted by the using activity will generate the need for an action message to modify or delete the assignment.

D113. <u>FREQUENCIES NOT REQUIRING SPECIFIC AUTHORIZATION</u>

When the following types of frequencies are used as described in referenced Annex, no specific authorization is required:

a. International Distress and Emergency. (Annex J)

b. Miscellaneous Radiating Devices. This includes restricted radiation devices such as industrial, scientific, and medical (ISM) equipment; radio receiver; cordless telephones; and electronic fuses. (Annex C)

D114. <u>FREQUENCY COORDINATION REQUIREMENTS</u>

Each applicant will coordinate proposed frequency assignments as delineated in Paragraph 3 and include in the request a statement of completed coordination (who, when, where, etc.) and comments by the coordinating agency. If the applicant and coordinating agency cannot reach an agreement, the applicant will forward problem/issue through normal frequency management channels for resolution.

D115. <u>SPECIFIC COORDINATION PROCEDURES</u>

Specific coordination requirements and procedures are:

a. Installation. Frequency assignment requests are always coordinated by the frequency manager responsible for the particular station, base, or post prior to forwarding the request.

b. Federal Aviation Administration (FAA). For the following frequencies and frequency bands, U.S. Navy AFCs will coordinate frequency actions (new, modifications, five-year reviews, and renewals) with the appropriate FAA Regional Frequency Management Office:

190-285 kHz	1030 MHz
325-415 kHz	1031-1087 MHz
75 kHz	1090 MHz
108-121.975 MHz	1104-1149 MHz
123.575-128.825 MHz	1156.5-1213.5 MHz
132.015-136 MHz	1215-1400 MHz
328.55-335.45 MHz	2700-2900 MHz
977.5-1020.5 MHz	5000-5250 MHz
	9000-9200 MHz

(1) The FAA recommends a properly engineered frequency for air traffic control as well as a pulse repetition rate for radar and radar beacons. They will coordinate on your proposed service volume, flight level, and desired-to-undesired signal levels (usually in dBs), and they nominate channels for instrument landing systems (ILS), VHF omnidirectional range (VOR), and TACANs. An FAA coordination number must be provided in item 504.

(2) VHF military common channels 126.2 MHz and 134.1 MHz are for the military use to control military aircraft only. The VHF military common channels do not afford the proper protection and therefore cannot be used for the control of commercial and private aircraft. All other VHF frequencies in the 118-136 MHz band are for the air traffic control (ATC) of commercial, military, and private aircraft and are FAA engineered for proper protection (14 dB). Any U.S. Navy facility with an ATC agreement to control airspace that commercial and private aircraft will/could transit, must use only properly engineered frequencies at that facility for ATC control for these aircraft.

c. Frequency Requests for Navigational Aids (NAVAIDs). For the NAVAID indicated, the following special frequency request procedures apply:

(1) Air Traffic Control Radar Beacon System (ATCRBS), Identification Friend or Foe (IFF), and Selective IFF (SIF). The ground station frequency of 1030 MHz is the only one that requires assignment and recording in the frequency records. FAA has statutory responsibility for the ATCRBS. Hence, in the US&P, frequency requests for 1030 MHz will contain the FAA coordinated pulse repetition rate (PRR) and the radar nomenclature and PRR of its paired primary radar. Use of 1090 MHz requires FAA coordination and IRAC approval when used in other than ATCRBS, IFF, and SIF configurations.

(2) Aeronautical Radio Navigation Frequencies (1300-1350 MHz, 2700-2900 MHz, and 9000-9200 MHz). The use of aeronautical radio navigation frequencies is restricted to ground based radars and requires coordination with the regional FAA office. The use will include associated airborne transponders which transmit only on frequencies in these bands and only when activated by radars operating in the same band. Radar equipment performing a function other than those listed below will not normally have frequency assignments in these bands:

(a) Long range radars (LRR) performing an ATC function will use the 1300-1350 MHz band.

(b) Airport surveillance radars (ASR) performing an ATC function will use the 2700-2900 MHz band.

(c) Precision approach radars (PAR) performing an ATC function will use the 9000-9200 MHz band.

(3) VOR, ILS, and TACAN. Units requiring new VOR, ILS, and TACAN channels will coordinate with the appropriate FAA Regional Frequency Management Office before submitting the request to the NAVEMSCEN.

(4) Microwave Landing Systems (MLS). Frequency requests to support MLS in the 5000-5200 MHz band must be coordinated with the appropriate FAA regional frequency manager prior to submission to the NAVEMSCEN.

d. National Test Ranges. Each DoD Area Frequency Coordinator (AFC) is responsible for frequency management within its designated geographical area. Applicants requesting frequencies for use in or around the DoD AFC's area of responsibility will coordinate the request with that DoD AFC in advance. The DoD AFCs are as follows:

(1) Western AFC
(2) AFC, Arizona
(3) White Sands Missile Range AFC
(4) Gulf AFC
(5) Eastern AFC
(6) AFC, Kwajalein Missile Range
(7) AFC, Nevada
(8) AFC, Alaska

e. Frequency Requests for Ionospheric Sounders.

(1) A proposal for an Ionospheric Sounder must include a statement that no existing authorized sounder can fulfill the requirements. This must be included in Item 520.

(2) Harmful interference must not be caused to international distress, amateur and standard frequency and time signals. Below is a list of current bands (all kHz) that must be excluded for sounder operations:

2081-2530	7970-8446	15970-16030	24970-25670
2993-3053	9970-10030	16410-16817	26090-26111
3970-4220	12280-12628	19670-20030	27494-27554
4620-5030	13360-13410	21850-21870	
5650-6324	14970-15030		

(3) Normal Chirpsounder station class, emission, and power are SN, 2H50NON, W10. For synching and resynching the system, 100 watts of power is authorized.

(4) All permanent sounders are assigned start times according to USMCEB policy (ACP 191 ( )).

f. Frequency Requests for Antenna Testing Frequencies Above 30 MHz. The following additional data are required for inclusion, when applicable, on each frequency proposal for the testing of antennas above 30 MHz, in order to expedite action on the application and to enable present users of the frequencies to evaluate the potential interference.

(1) Frequency Transmission Data

(a) Frequencies or frequency band(s) required. (NOTE: The proposed use of individual frequencies vice frequency band(s) will greatly facilitate consideration of the request.)

(b) Transmission Characteristics

<u>1</u> Transmitter output power.
<u>2</u> Effective radiated power (if ERP is unknown, give a reasonable estimate).
<u>3</u> Types of emission.

<u>4</u> Bandwidth for each type of emission.

(2) Supporting Information

(a) Name of geographical location and latitude and longitude of antenna site to the nearest second.

(b) Test Environment

1 Profile of terrain: description, maps and/or other means.
2 If tests are to be conducted within shielded enclosure(s), so state, and give the attenuation (in dB) of the enclosure.

(c) Antenna Configuration

1 Type of antenna(s).
2 Whether full scale or less than full scale.
3 Azimuth of the main lobe.
4 Gain.
5 Beam width in azimuth and elevation.
6 Height above ground.
7 Height above mean sea level.

(d) Period of Operation.

1 Duration of requirement, including the dates it will be required.
2 Estimated hours of use, in local time; for example, 0800 to 1700 daily Monday through Friday; daytime only Monday through Friday.

(3) Justification.

(a) Except in very extraordinary circumstances, applications should not be made for bands where regulations prohibit the granting of assignments, for example, the radio astronomy bands, the standard frequency bands, certain space bands. (See U.S. Table of Frequency Allocations.) If an assignment falling in the prohibited band is requested, a complete and adequate justification must be given as to why operation within the prohibited band is required.

(b) The service should be specified for which the operational use of the antenna under test is intended, for example, radiolocation, radionavigation, fixed, space.

(c) Unusual conditions should be justified, for example, high power for breakdown tests.

(d) If the testing is being done under government contract, the government agency and contract number should be specified.

h. Frequency requests for LMR Systems. Nearly all frequency assignments for LMR systems have been in the 148-150.8 MHz and 162-174 MHz bands. Due to congestion in those bands, units requesting LMR frequencies will usually receive assignments in the 138-144 MHz or 406-420 MHz bands, unless operational reasons necessitate the use of another band. Before deploying equipment overseas, users must make sure LMR frequency authorizations will be available.

i. Frequency Request for Frequency Diversity Authorizations. The use of frequency diversity for line-of-sight (LOS) transmission in the bands 1710-1850, 2200-2290, 4400-4490, 7125-7250, and 8025-8400 MHz will be limited. Users must justify the use of frequency diversity for new LOS fixed radio systems. Existing systems employing frequency diversity may continue in the use until frequency congestion requires re-evaluation. In the justification for frequency diversity, include a statement of the requirement for such a high degree of systems reliability. Also state that an engineering evaluation shows that to achieve the required reliability, frequency diversity is necessary.

j. Aerospace and Flight Test Radio Coordinating Council (AFTRCC) Coordination (1435-1535 MHz and 2310-2390 MHz Bands). U.S. Navy AFCs will coordinate requests for frequencies in these bands with the appropriate DoD AFC. The AFC will coordinate the requests with AFTRCC. A copy of the completed AFTRCC coordination document will be provided to NAVEMSCEN for FCC, Washington, D.C. coordination. (See Annex J, paragraph 8 for more information on these bands).

D116. <u>MESSAGE FORMAT</u>.

SFAF frequency assignment transactions are frequently sent by message via the AUTODIN. The following format is provided by the USMCEB for the preparation of these transactions:

a. Headings. Message headings must be formatted in accordance with approved communications procedures.

b. Security Classification. The overall security classification of the message is based on that of the highest classified data item or combination of data items contained therein.

c. Subject. The subject line of the message begins with **FREQUENCY PROPOSAL** or **FREQUENCY ASSIGNMENT,** suffixed as required. For example: **FREQUENCY PROPOSAL, USN.** For crisis or contingency requirements, include **FOR CONTINGENCY COMMUNICATIONS** and the unclassified plan name or number, if available. For example: **FREQUENCY PROPOSAL FOR CONTINGENCY COMMUNICATIONS, USN (OP PLAN 207-81).**

d. Text. A message may contain information pertaining to more than one frequency assignment. When this occurs, Item 005 (Security Classification) and Item 010 (Type of Action) must be the first items listed in each message part. All data items must be listed in a vertical format and be in the same numerical sequence as shown in Annex D-1. Each line in the message is limited to 69 characters (including spacing and punctuation marks). This limitation is based on the AUTODIN's maximum line-length capability and is not to be confused with the data item input length limitations specified for each data item in Annex D-1. If a data item requires more than one line of text, each additional line must be preceded by the data item number or data item occurrence identifier. Multiple entries for the same data item may be included on the same line (e.g., **110A. K1030 110B. K1040**), and continued on the next line when necessary. See paragraphs 3c(1) and 3f for details on entering more than one line of text for a particular data item.

e. Abbreviated Message Format. An abbreviated message format may be used for frequency proposals whose period of requirement will not exceed 90 days. As a minimum, the following data items must be included: 005, 010, 110, 113, 114, 115, 140, 141, 200, 207, 300, 301, 340, 400, 401, 440, 502, 803, and other applicable items in the 500 series. Note: For DIS high-frequency (HF) entry exercises, also include Data Items 303, 354, 403, and 454; for pulsed emitters, also include Data Items 346 and 347; for aeronautical navigational aids and for air traffic control assignments, also include Data Items 303, 403, 711, and 801.

D117. PROCEDURES

The following procedures must be followed when using the SFAF:

a. Prohibited Data Entries. The following symbols are not to be used as input data:

&	(ampersand)	?	(question mark)
:	(colon)	<	(less than)
;	(semicolon)	>	(greater than)
[	(left square bracket)	%	(percent sign)
]	(right square bracket)	!	(exclamation mark)
\	(reversed slant bar)	^	(Insert Caret)
#	(number/pound sign)	"	(quotation mark)
@	(at sign)	'	(apostrophe)

b. Restricted Data Entries. The slant bar (/), comma (,), and dash (-) are used as delimiters, however, they may also be used as part of the text in data items as indicated below.

(1) The slant bar may be used as data in Items 340, 343, 362, 440, 443, 462, 501, 502, 503, 504, 520, and 530. For use of the slant bar as a delimiter see paragraph 3c(1).

(2) The comma can only be used as data in Data Items 152, 501, 503, 504, 520, and 705. For use of the comma as a delimiter see paragraph 3c(2).

(3) The dash cannot be used in Data Items 300, 301, 400, and 401. For use of the dash as a delimiter see paragraph 3d(1).

c. Data Item Occurrence Identifiers. Slant bars and commas may be used as data item occurrence identifiers as indicated below:

(1) Slant Bars. Slant bars are used to (a) separate multiple occurrences of data entries within a data item (e.g., **500. S049/C075**), (b) identify the order of occurrence of such data when modifying an existing record (e.g., **500/2. S165**), and (c) identify the order of occurrence of the first data element in each additional line of text when multiple occurrences of a data item exceed the message input line-length limitation of 69 characters, continue entries on succeeding lines. However, start each succeeding line with the order of occurrence identifier of the first data element in that line (e.g., if a new transaction contains nine emission entries and seven entries were entered on the first line, the second line would begin with **114/8**). If an order of occurrence identifier is not specified, number one is assumed. Note: Do not split a data element between lines.

Order of occurrence identifiers are not used for free-text data items where each line begins with only the 3-digit item number (e.g., Data Items 502, 520, 531, and 801-807).

(2) Commas. Commas are used to separate elements within a data entry (e.g., **340. G,AN/FRC-102**). A combination of slant bars and commas can be used in the same data entry (e.g., **340.G,AN/FRC-22/G,AN/GRC-122**). However, commas and slant bars cannot be used interchangeably; that is if input instructions specify a comma, a slant bar cannot be used, and vice versa.

d. Receiver Location Identifiers. Receiver location identifiers consisting of the letter R and a 2-digit number (01 through 30) are used to indicate whether the data is associated with the first, second, third, etc., receiver location. The receiver location identifier is entered immediately following the data entry reported for that item. For example, **444. CO,R02**.

In this example, **400.** (State/Country) is the data item identifier; CO (Colorado) is the data entry for that item; and **RO2** indicates that the data applies to the second receiver location. Note: If no receiver location identifier is specified, number one is assumed (e.g., **400. C0**).

(1) Identical Data Entries. Data entries that are the same for consecutively numbered locations can be identified by inserting a dash between location identifiers. For example, **457. 12,r01-r05**. In this example, **457.** (Antenna Gain) is the data item number; **12** indicates the reported value for antenna gain (in decibels); and **R01-R05** indicates that this antenna gain applies to receiver locations one through five.

(2) Nonidentical Data Entries. Data entries that are not the same for two or more consecutively numbered locations can be identified by inserting a space following the location identifier and the start of the next data element. For example, **457. 10,R01-R02 20,R03.** In this example, **457.** is the data item number; **10** indicates the antenna gain for the antenna; **R01-R02** indicates that the antenna is at the first and second receiver locations; **20** indicates the gain for the antenna at the third receiver location (**R03**).

e. Data Item Purge Identifiers. There are two types of data item purge identifiers: single-item purge identifier and mass-purge identifier.

(1) Single-Item Purge Identifier. A dollar sign following a data item number (e.g., **205. $**) means that the data item is to be purged from the existing record. If a data entry contains more than one data element, then the entire entry is deleted. If a data item contains multiple data entries, the order of occurrence of the entry(ies) to be purged must be specified. For example, **207/2. $.** In this example, the data item occurrence identifier (**/2**) indicates that only the second operating unit designator in the record is to be purged. All remaining entries will be automatically renumbered during the purge process. Note: If a data item occurrence identifier is not specified, number one is assumed (e.g., **340. $**). The data item purge identifier can be entered on one line for records containing multiple data entries, some of which are being

modified or deleted (e.g., **207. 123ISS/456ISS/11BW** could be change by entering **207. 123CS/456CS/$**). An item being purged cannot be followed by an entry to add data in the same item, except Data Items 502, 520 and 531 which are discussed in Annex D-1.

(2) Mass-Purge Identifier. A special mass-purge feature is available to simplify the process of deleting large quantities of related information in Data Items 113, 340, 354, 400, 440, and 454. Using the dollar sign with these data item numbers will cause not only that particular data item to be purged, but all related data items as well. Note: If no data item occurrence identifier is specified, number one is assumed (e.g., **340. $**). The following are a few examples of how the mass-purge feature can be used.

(a) **113. $** will delete the first station class and the corresponding emission and power items (113, 114, and 115). If a record contains multiple entries, **113. $, 113/2. $, 113/3. $**, etc., would be needed to delete all entries, or **113. $/$/$** could accomplish the same thing.

(b) **340. $** will delete all data associated with the transmitter equipment in Data Items 340 and 343-348. If multiple equipments are used, **340. $, 340/2. $, 340/3 $**, etc., would be needed to delete the additional equipments.

(c) **354. $** will delete the transmitter antenna and associated Data Items 354-357 and 359-363.

(d) **440. $,R03** will delete all data associated with the third receiver location (Data Items 400 through 472).

(e) **400. $,R03-R05** will delete all data associated with the third, fourth, and fifth receiver locations (Data Items 400 through 472).

(f) **440/3. $,R02** will delete all data associated with the third receiver equipment at the second receiver location (Data Items 440 and 443).

(g) **454. $,R02** will delete all data

associated with the receiver antenna at the second receiver location (Data Items 454-457 and 459-472).

f. Multiple Record Identifiers. Multiple record identifiers are used to link related data items utilizing the ABC concept (e.g., 113A, 113B, 113C, etc.). Multiple record identifiers can consist of a combination of data item numbers and data item numbers with alpha characters. Recommend like-numbered data items be entered in alphanumeric order (e.g., 113A, 113B, 113C, 114A, 114B, 114C). Multiple record identifiers may be used for all data items except 005, 006, and 010. Multiple record identifiers can be used for all types of actions. To reduce the number of message lines, multiple record identifiers and their data elements may be entered on the same line as long as the last data entry on each line is complete. Leave one space between the end of the previous data element and the start of the next multiple record identifier (e.g., **113A. FA 113B. MA**).

The following rules apply:

(1) For data item number <u>without</u> letters, the data will apply to each record identified in that message part.

(2) For data item numbers <u>with</u> a letter, the data will apply only to the record identified by that particular letter.

(3) Data item numbers with a letter will override those without a letter. Input for the data item number with a letter will appear in the record created by that particular letter. See Data Items 113 and 114 in the following example for further clarification.

005. ____________________
010. ____________________
102A. ___________________
102B. ___________________
102C. ___________________
102D. ___________________
110A. ___________________
110B. ___________________
110C. ___________________
110D. ___________________
113. LR 113C. MR 113D. MR
114. 150H00NON 114C. 6M00P0N
205A. EUSA 205D. EUSA
209. JKOR

Based on the above example, four records (A, B, C, and D) would be either created or acted upon. Data Items 005 and 010 are the same in all four records. Note: When multiple record identifiers are used in the same message part, all records must contain the same security classification, special handling instruction code, declassification/review instructions, and type of action. Each frequency assignment would contain **113. LR** and records C and D would contain **113. MR.** Record C would contain **114. 6M00P0N** and records A, B, D would contain **114.150H00N0N**. Records A and D would contain **205. EUSA** and records B and C would not contain a Data Item 205 if Data Item 010 equals N. If Data Item 010 equals M, A, C, F, or D, then Data Item 205 would remain unchanged in records B and C. Record A would contain **206. 7SIG** and records B, C, and D would not contain Data Item 206 if Data Item 010 equals N. If Data Item 010 equal M, A, C, F, or D, then Data Item 206 would remain unchanged in records B, C, and D. All records would contain **209. JKOR**.

D118. RADIO FREQUENCY PROPOSAL/ASSIGNMENT ACTIONS

All Navy and Marine Corps frequency proposals and assignments, modifications or deletions of assignments, and assignment (5-year) reviews will be submitted by message. The information included in a proposal/assignment message is to be transmitted in a vertical message format containing the following elements of information, as applicable, in sequential order. The maximum letter length of each term, if applicable, is found in parentheses under each item title.

** Items marked with two asterisks are used by headquarters of the Army, Navy, Air Force, DISA, NSA, and unified or specified commanders.

*** Items marked with three asterisks are completed automatically by computer.

VERTICAL FORMAT ITEM AND SEQUENCE	REMARKS/INSTRUCTIONS
SECURITY CLASSIFICATION	Classification: The overall classification of the message will be based on the classification of the highest classified data item or combination of data items as appropriate. Classified data will be identified by entering a security classification code in parenthesis, immediately following the item number. For example: 502. (C) REQUIRED FOR CONTINGENCY PLAN 999....The use of (U) for unclassified items within a classified record is not required if the following statement is inserted between the classification line and the subject line of the message "ITEMS NOT IDENTIFIED AS CLASSIFIED ARE UNCLASSIFIED." Information inserted in all other items of the message shall be UNCLASSIFIED or

	classified CONFIDENTIAL.
SUBJECT	All messages will include a subject (unclassified when possible) to assist in proper distribution at receiving headquarters. The subject will normally be "Frequency Proposal" or "Frequency Assignment" followed by the abbreviation for the cognizant Service/Agency. For crisis or contingency requirements, the unclassified plan name and number, if applicable, should be added to the subject line.
REFERENCE(S)	As required.

ADMINISTRATIVE DATA

005 Security Classification (2,6)	Enter the overall security classification of the frequency proposal or assignment applicable to this message part and appropriate special handling code followed by the declassification/review instructions. Enter the classification code and, if applicable, the special handling code from the following lists: U - UNCLASSIFIED C - CONFIDENTIAL S - SECRET SPECIAL HANDLING CODES B - Releasable soil country and NATO only.

SPECIAL HANDLING CODES (Contd.)

E - Exempt from freedom-of-information act; handle as "For Official Use Only" in accordance with DoD Instruction 5400.7.

F - Not releasable to foreign nationals.

H - Releasable to soil country only.

J - Contingency assignment. Has unified commander comments only. Not releasable to foreign nationals unless formally coordinated.

K - Permanent assignment. Available for contingency use within theater after coordination and approval of cognizant unified commander. Releasable to soil nations.

L - Air Force limited distribution.

N - Releasable to NATO only.

P - Proprietary.

Q - Proprietary with limited distribution.

R - Restricted Data.

W - Formerly Restricted Data.

X - Not releasable to foreign nationals with limited distribution.

	Z - Releasable to NATO only with limited distribution. For SECRET or CONFIDENTIAL records follow the classification with a comma and the declassification instructions in the following format: DEYYMM - Declassify on year and month. (The last day of the month is assumed.) DEOADR - Declassify on: Originating Agency Determination Required Examples: 005. S,DEOADR 005. CB,DE8311 005. U
006 Security Classification Modification (2,6) (S)	If the record classification, special handling code, or declassification/review instructions are to be changed, enter the new classification data and make appropriate classification code changes to the items that are affected. Examples: 006. SB,DE8807 006. U 006. CB,DEOADR
010 Type of Action (1,12) (S)	Enter a single letter to describe the type of action as shown below. Note: This item is not stored in the data base. A - Administrative Modifications. To be used only as specified in paragraph 11.

010 Type of Action (Contd.)

N - New. For proposal(s)/ assignment(s).

C - Copy. Enter the letter "C" followed by the agency serial number (in parenthesis) to copy any approved data base record. Enter the letter "C" followed by the agency serial number to copy a record formatted in a previous part of the same message.
Add only those items to be changed. (To be used only in accordance with MILDEP/ Agency/Unified Command Procedures.)

D - Delete. For deletion(s).

E - Expired. Computer generated at NTIA indicating the record has expired from the GMF and is being removed from the FRRS.

M - Modification(s).

R - Renewal(s). Used to extend the expiration date of a temporary assign-ment. Other data may be changed as necessary.

**	F - Notification(s). Notifies the activation of a frequency for a particular station or stations under the authority of a group assignment. Example: 010. M 010. C(N814128)
020 Proposal References (64) (M) **	Enter the requestor's message DTG with plain language address (PLAD) or letter reference. For proposals transmitted via AUTODIN, the DTG will automatically entered into each FRRS transaction files only; it will not appear in the GMF or FRRS master files. Example: 020. 041325Z DEC 87
102 Agency Serial Number (10) (S)	Enter the Agency Serial Number, if known. When more than one frequency is listed in Item 110, enter the corresponding Agency Serial Numbers as Item 102A, 102B, etc. Example: 02A. N775163 102B. N783105
103 IRAC Docket Number (8) (M)	This is a computer generated output item only. Provides three IRAC docket numbers as follows:
***	(1) Docket number for current modification or renewal. (2) Docket number for last modification or renewal. (3) Original docket number for

	this assignment. Example: 103. I8115742/I7625457/I7132646
104 Assignment Authority (15) (M)	Identifies the existing assignment message. Example: 104. J0212241180
105 List Serial Number (10) (S) **	Enter the List Serial Number only if the type of action is Notification. Example: 105. N765530
106 Serial Replaced, Delete Date (10,6) (S)	If an existing assignment record (Item 144= Y) is to be deleted from the GMF with a NEW or NOTIFICATION action, enter the agency serial number of the existing assignment followed by the desired date of deletion in year-month (YYMM) order. Note: This item is not stored in the data base. Example: 106. N820512,931031
108 Docket Numbers of Older Authorizations	This data item is optional. Enter up to 35 alphanumeric characters for DOCKET NUMBERS OF OLDER AUTHORIZATIONS to be retained in a NEW or NOTIFICATION action as applicable. Used when re-instating assignments that were inadvertently deleted. Multiple Docket entries are allowed within a 35 character line by separating them with a comma. Authoriza-

tion dates and serial numbers may also be entered along with the docket numbers within a 35 character line by separating them with commas.

Examples:

108. I84729 - Docket only
108. I73621,5704 - Docket and date
108. I67543,5510, N750218 - Docket, date and serial
108. I89432,I6723419 - Two dockets
108. I6943591,N690431 - Docket and serial

EMISSION CHARACTERISTICS

110	Frequency(ies) (11-11 or 11(11)) (S)	Enter the discrete frequency or frequency band assigned to the unit and/or required for the equipment described in the assignment. A reference frequency, if included, is the assignment or a suppressed or reduced carrier sideband. For a frequency band assignment, enter the lower frequency and the upper frequency (separated by a dash) with the frequency unit indicator preceding the lower frequency. For sideband operations, enter the reference frequency in parentheses after the assigned frequency. For frequency band(s) that are to be excluded from a given frequency band, enter the excluded bands in Item 111 (see example A). Precede the frequency value with unit indicators as follows:

110 Frequency(ies) (Contd.)

K - if frequency is less than 30 MHz.

M - if frequency is at least 30 MHz, but less than 100 GHz.

G - if frequency is at least 100 GHz, but less than 3 THz.

T - if frequency is 3 THz or greater.

Insert a decimal point only if there is a significant digit to the right of the decimal point. If more than one frequency or more than one band of frequencies is listed, enter the first as Item 110A, the second as 110B, etc. (See example B). Do not enter the unit indicator with the upper limit value of a band.

FREQUENCY BAND ASSIGNMENTS are normally authorized only for the following:

(a) Transmitters which automatically sweep through all frequencies in a band.

(b) Radiosonde transmitters operating in either of the bands:

400.15-406.00 MHz
1670.00-1700.00 MHz

(c) Frequency agile radar beacons (racon) operating in either of the bands:

2900-3100 MHz 9300-9500 MHz

FREQUENCY BAND ASSIGNMENTS (Contd.)

(d) Transmitters which use automatic frequency selection based upon changing propagation conditions along the transmission path.

(e) Transmitters which automatically pause at fifteen or more *specific operating frequencies* within a band.

(f) Operations which require the use of fifteen or more *specific operating frequencies* within a band for research, development, test, and/or evaluation purposes.

(g) Operations which involve a multitude of mobile radiolocation or radionavigation transmitters. Whenever possible, at the option of the applicant, operational frequencies may be recorded in the CIRCUIT REMARKS *AGN sub-field (SFAF Item 503).

(h) Tactical and/or Training assignments above 30 MHz which require the use of fifteen or more *specific operating frequencies* within a band.

(i) Operations devoted exclusively to electronic warfare (EW), electronic countermeasures (ECM), and/or electronic counter-counter-measures (ECCM).

NOTE: If a different station class, emission, and power apply to each frequency (band), use the same multiple record

	identifiers in Items 113, 114, and 115 as were entered in Item 110 (See example C). Example A: 110. K6737.5(6736) Example B: 110. M13250-15700 111. M14770-14930 Example C: 110A. K6737.5(6736) 110B. K17034 113A. FX 113B. FX 114A. 3K00J3E 114B. 6K00B9W 115A. K1 115B. K10 A proposal might read as follows: Example: 110. Two frequencies in band M138-144.
111 Excluded Frequency Band (23) (M)	Enter the frequency band (or bands) to be excluded (in ascending order) from the frequency band data entered in Item 110. Separate multiple frequency bands by a slant bar. Do not enter the K,M,G, or T indicator with the upper limit value. When more than one frequency is listed in Item 110, enter the corresponding excluded frequency bands as Items 111A, 111B, etc. (limited to 20 occurrences).

Example:

111. M960-17700/M2200-2400

113 Station Class (4) (M)	Enter standard station class symbol(s). Include suffix "R" if a fixed or mobile station is used as a repeater. (Item 113, 114, and 115 are inter-related, and each entry in any of the three items must be accompanied by a corresponding entry in the other two items.) Separate multiple entries with a slash. (See Annex G for station class symbols.) Example: 113. FX/FX
114 Emission Designator (11) (M)	The emission designator contains the necessary bandwidth and the emission classification symbols. The necessary bandwidth will be entered with the unit designator in the position the decimal would normally occupy. Use: H - if value is less than 1000 Hz. K - 1 kHz to values less than 1000 kHz. M - 1 MHz to values less than 100,000 MHz. G - 1 GHz or greater. Doppler shift shall not be included in the frequency tolerance or bandwidth of emission; however, when doppler shift is significant, it should

	be reported in Item 520. (See Annex G for discussion of emission designators.) Example: 114. 2K80J3E/3K00J7B
115 Transmitter Power (9) (M)	Enter (1) Carrier power (pZ) for A3E sound broadcasting in the broadcasting service, (2) meanpower (pY) for other amplitude modulated emissions using unkeyed full carrier, and for all frequency modulated emissions, and (3) peak envelope power (pX) for all emission designators other than those referred to in (1) and (2) above, including C3F television (video only). Express the power to the maximum of five decimal places and precede the entry with the unit designator as follows: W - if power is less than 1000 watts. K - if power is at least 1 kW but less than 1000 kW. M - if power is at least 1 MW but less than 1000 MW. G - if power is 1 GW or greater. Example: 115. K1.5/K1.5

TIME/DATE INFORMATION

130 Time (4 pr 1(4)) (S)	The period indicated is not a limitation or restriction but rather the normal period of time during which the availability of the frequency is required. Use the appropriate number as follows:

TIME/DATE INFORMATION (Contd.)

1. regular, not limited to workweek.

2. regular, workweek.

3. occasional, not limited to workweek.

4. occasional, workweek.

For stations in the fixed service below 29890 kHz, the above number will be followed by one of the following symbols to indicate the time of availability on a daily basis:

HX - For stations operating intermittently throughout the 24-hour day or for circuits with no service working hours.

HN - Night Service.

HJ - Day Service.

H24 - Continuous service throughout 24 hours.

HT - For transition period service, or the specific time Universal Greenwich Time (UGT). Enter, in parentheses, the actual time per period of operation during the 24-hour day as a four-digit number. The first two digits are the nearest whole hour of start time, and the last two digits are the nearest whole hour of end time.

Examples: 130. 2
130. 1H24
130. 4(1013)

140 Required Date (6) (S)	Enter the year, month, and day (YYMMDD) that assignment or modification is Note: This item is not stored in data base. Example: 140. 860101
141 Expiration Date (6) (S)	If the assignment is for less than 5 years, enter the year, month, and day (YYMMDD) the requirement for use of the assignment will end. Presence of this data item indicates a temporary assignment. All experimental station classes will have Item 141. When the experimental system is brought into operational use and a permanent assignment is required, Item 141 needs to be deleted (141. $) with corresponding changes to Items 113 and other items, as applicable. Note: Assignments will be automatically cancelled on their expiration date. Example: 141. 871215
142 Review Date (6) (S)	Computer generated if blank. Enter the year, month, and day (YYMMDD) if the desired review date is less than five years. Example: 142. 881231
144 IRAC Record Indicator (1)	IRAC record indicator is required on all actions. Use the appropriate code below: Y - Assignment record is to be processed through IRAC.

U - Assignment record is inside US&P and is <u>not</u> to be processed through IRAC.

O - Assignment record is outside US&P and is <u>not</u> to be processed through IRAC.

N - Existing IRAC assignment which contains a value of Y, but this transaction is <u>not</u> to be processed through IRAC.

This value will not be stored in the record.

Example: 144. Y

145 IFRB Registration
(1)   (S)
**

The International Frequency Registration Board (IFRB) data item indicates the action taken on an assignment to register it with the IFRB of the International Telecommunication Union. If known, enter the appropriate IFRB registration indicator from the following list:

R - Notified and Registered by IFRB.

U - Notified to IFRB, but negative decision taken and not accepted for registration.

I - Registration with IFRB on an insistence basis.

O - Not notified to IFRB.

P - Pending notification to IFRB.

M - Registered with IFRB but needs to be modified.

	Y - IFRB registration required. Example: 145. R
146 DIS Trunk ID (6) (M) **	Enter the Defense Information System (DIS)trunk indicator assigned by DISA. See Chapter 66 of DISAC 310-65-1. Example: 146. 45CS01/45US02
147 Joint Agencies (4) (M) **	The Joint Agencies data items indicate assignments where one or more agencies are involved besides the agency identified in the agency serial number data item. Leave this item blank unless Item 200 = JNT. For a joint application, enter the appropriate abbreviation of each joint agency (maximum of 3). Enter the agency identified in the Agency Serial Number Data Item 102 as the first joint agency, separate entries with a slash. Enter H for unidentified agencies in non-IRAC assignments. Examples: 147. AR/FAA 147. N/AF/J 147. H
151 Coordination (1) (S)	For assignments near U.S. borders, enter one of the following codes: C = Coordinated with Canada. M = Coordinated with Mexico.

B = Coordinated with both Canada and Mexico.

For EUCOM assignments, enter one of the following codes:

M = Coordinated with NATO for inclusion in the MRFL.

H = Coordinated with Host Nation.

B = Coordinated with both NATO and Host Nation.

Example: 151. C

152 Coordination Data (35) (35) (M)

For new records being created from existing records (serial replaced actions), comments as previously coordinated by the FAS secretary with Canada or Mexico. Comments for other NEW assignments will be entered by NTIA/FAS secretary when the coordination comments are received from Canada or Mexico.

Example:

A. 152. CAN, 780029, NHIA
B. 152. CAN, 750361, No mobile use within 40 km
C. 152. CAN, RAD of Burnaby BC

ORGANIZATIONAL INFORMATION

The "200" items serve two major purposes. They identify the frequency management chain responsible for managing the assignment and the organization having an area interest in the assignment. Entries in the 200 series of items are generally derived from the PLAD (Plain

ORGANIZATIONAL INFORMATION (Contd.)

Language Address) used in addressing AUTODIN messages. The "200" item entries will be managed by Navy Area Frequency Coordinators. They will determine which agencies need to be identified. The following general rules are to be used for formatting the PLAD data for entry into 200 series items in FRRS frequency assignment proposals:

(1) Remove blank spaces.

(2) Remove CG, COM, COMNAV, FLE, and/or NAV prefixes, where feasible (for example: COMPATWING becomes PATWING, and NAVBRIG becomes BRIG). There are some exceptions (for example: NAVSEA, NAVFAC, etc.).

(3) Convert numerical text into integers (for example: UCT ONE becomes UCT1 and SECOND LAAMBN becomes 2LAAMBN).

(4) When converting an address with multiple organizational levels present, list the unit text in descending level order as shown below:

1. MAG FOUR TWO DET ALFA becomes MAG42DETA.

2. FOURTHPLT ALFACO FOURTH ASLTPHIBBN becomes 4ASLTPHIBBNACO4PLT.

3. FIRSTBN TWO FIVE MAR becomes 25MAR1BN.

ORGANIZATIONAL INFORMATION (Contd.)

(5) Use these location, geographic, and organization conventions, where possible:

a. LOCATION CONVENTIONS

CENTERVILLE BEACH = CNTRVBCH
CHARLESTON = CHASN
CORPUS CHRISTI = CRPSCHRS
CUBI PT = CUBI
DIEGO GARCIA = DGA
GREAT LAKES = GLAKES
GUANTANAMO BAY = GTMO
GQ = GUAM
JACKSONVILLE = JAX
KANEOHE BAY = KANEOHE
LITTLE CREEK = LITTLECR
NEW ORLEANS = NORLEANS
NORFOLK = NORVA
PACIFIC BEACH = PACFCBCH
PACIFIC GROVE = PACFCGRV
PATUXENT RIVER = PAXRV
PEARL HARBOR = PEARL
PHILADELPHIA = PHILA
ROOSEVELT ROADS = ROOSRDS
SAN DIEGO = SDIEGO
SAN FRANCISCO = SFRAN
SUBIC BAY = SUBIC
TWENTYNINE PALMS = 29PALMS
WASHINGTON DC = WASHDC
YOKOSUKA = YOKOS

b. GEOGRAPHIC CONVENTIONS

CAMP = CP
FIELD = FLD

FORT = FT
HARBOR = HRBR
ISLAND = IS
KEY = K
LONG = L
POINT = PT
RIVER = RV
SAINT = ST
SAN = S

c. ORGANIZATION CONVENTIONS

COMNAVBASE = NB
INSP INSTR STF = I-I
NAVCOMTELSTA = NCTS
NAVCOMMU = NCU
NAVMARCORESCEN = NMCRC
NAVOCEANSYSCEN = NOSC
NAVSECGRUDEPT = NSGA
NAVSECGRUDEPT = NSGD
NAVSHIPD = NSY
NAVSTA = NS
NAVUSEAWARENSTA = NUSWES
TRANSITPERSU = TPU

(6) If after applying the above rules the unit text entry still exceeds the permitted characters then the entry can be truncated as shown below:

a. EODGRU2DETBRUNSWIC for EODGRU TWO DET BRUNSWICK ME

b. SEADETNISMFPORTSMO for NAVSEA DET NISMF PORTSMOUTH VA

200 Agency (6) (S) — Enter Service or Agency as appropriate. For U.S. enter one of the following: USA,

	USN, USAF, DISA, NSA, or JNT. When JNT is entered, Item 147 must be complete. Example: 200. USN
201 Unified Command (8) (M)	Enter the unified command(s) or designated representative for the area in which this assignment will be used. Separate multiple entries with a slant bar. Enter CINCPAC, CINCEUR, CINCSO, JFMOLANT, CINCCENT. Examples: 201. CINCPAC 201. CINCEUR/CINCSO/JFMOLANT
202 Unified Command Service (8) (S)	Enter the organization within the Unified Command area that is responsible for managing this assignment. Enter PACAF, PACFLT, WESTCOM, USAFE, NAVEUR, 5SIG, etc. Examples: 202. PACFLT 202. NAVEUR
203 Bureau (4) (S)	This item identifies the Bureau to be included in the record. Example: 203. (This item not used by Navy. For Marine Corps records, enter USMC.)
204 Command (8) (S)	Enter the frequency management level subordinate to responsible agency when different from sub-subcommand. Example: 204. PACFLT

205 Sub Command (8) (S)	Enter the frequency management level between command and sub-command when it exists. Example: 205. 7FLT
206 Installation Frequency Manager (18) (S)	Normally, this is the station, base, or fort level FMO for the location of the operating unit. Examples: 206. COMNAVFORJAPAN 206. COMNAVMARIANAS 206. NASPAXRV
207 Operating Unit (18) (M)	Enter the name or designation of the organization using the frequency assignment. Examples: 207. CGTHIRDMAF 207. SUBRON18 207. COMPHIBGRU
208 User Net/Code (6) (M)	Enter codes as directed by the responsible agency. For Navy enter Unit Identification Code (UIC). For Marine Corps enter Reporting Unit Codes (RUC). Examples: 208. N52618 208. M83268
209 Area AFC/DoD AFC/ Other Organizations (18)	Enter the DoD, CINC or service area frequency management office, or other organization not provided in Item 200-208. Separate multiple entries with a slant bar. Examples: 209. JJPN 209. WSMR/NFCWUS 209. NFCWUS/DISA/PAC
TRANSMITTER LOCATION	Enter no more than one transmit

DATA	location. If more than one transmit location is associated with this assignment enter as a separate message or message part referencing items to this message (part) as appropriate.
300 State/Country (4) (S)	Enter the name or abbreviation of the state, country, or area in which the transmitting antenna is located. (Refer to Annex G, paragraph 14, for rules to abbreviate.) Examples: 300. IN 300. LANT 300. DEEP SPACE
301 Antenna Location (24) (S)	Enter name of city, base, or geographical area where the transmitter antenna is located. Abbreviate if necessary; however, if abbreviation is not required, the entry should be spelled the same as in the U.S. Postal Zip Code Directory or applicable gazetteer. If the abbreviated entry has not been previously used, also enter the unabbreviated spelling in Item 801 for review by the assignment authority. After being entered the first time, all future entries for that same location should use the same spelling. In certain cases nongeographical entries may be used; e.g., MOON, MISSILE, AIRCRAFT, SHIPS, GEOSTATIONARY or NONGEOSTATIONARY. In addition to the above, the following will apply: a. Use the same spelling/ abbreviation as that used in Item 300, if applicable.

b. The following standard abbreviations will be used even if the entry is less than 24 characters.

Location Word	Abbreviation
Army Area	ARA
Camp	CP
Coast Guard District	CGD
City	CY
District	DI
Division	DIV
Fort	FT
Island(s)	IS
Large Navigational Buoy	LNB
Mont, Monte, Mount(s)	MT
Mountain(s)	MTN
Proving Ground(s)	PG
Point	PT
Saint	ST

Examples: 301. FT BRAGG
301. NASHVILLE
301. NONGEOSTATIONARY

302 Station Control (18) (S)

Enter the operating unit that controls, either administratively or electrically, the transmitter station if different from Item 207.

Example: 302. SUBRON17

303 Antenna Coordinates (15)

Enter geographical coordinates (degrees, minutes, and seconds) for the antenna location. For a geostationary satellite, enter the longitude only. If station is nongeostationary satellite, leave both latitude and longitude blank. If the seconds are not known, insert XX for the seconds, except in the case of NAVAIDS and microwave facilities. Use leading zeros as appropriate for degrees, minutes, or seconds. Degrees latitude require two digits; degrees longitude require three digits. Leave the item blank if the transmitter ANTENNA LOCATION is an area for which coordinates cannot be applied. Enter N or S for latitude and E and W for longitude.

Examples: 303. 214216N1171039W
303. 351952N0982605W
303. 042200S1780200E

304 Call Sign (6)

This item is for the international call sign assigned to the transmitting station. If local voice, tactical, or not applicable, leave blank. For navigational aids, this item is for the identifier instead of a call sign.

Examples: 304. WUH5S
304. NCX

306 Authorized Radius (5)

If the station is portable, mobile, and/or transportable, a radius (in kilometers) from the coordinates listed in Item 303 to describe the area in which the transmitter station will operate. Suffix the kilometer entry with a ",T" if the radius applies only to the transmitter station, or a ",B" if the radius applies to both the transmitter and receiver stations. Item 306 entries affect the need for completion of transmitter and receiver antenna data (antenna name, gain, elevation, feed-point height, antenna orientation, and polarization.) Antenna data is not required for the transmitter if suffix ",T" is used. No antenna data is required for transmitter and receiver if suffix ",B" is used. (Note: When both fixed and mobile stations will transmit on the same frequency, leave this item blank and enter the radius of the mobile station in Item 406.)

Examples: 306. 30,T
306. 150,B

SPACE STATIONS

Items 314 through 321 are to be used for unique space station data. Leave Items 315 through 319 blank for geostationary satellites.

314 SDC Object Number (5)

If known, enter the Space Defense Center (SDC) object number as listed in the SDC catalogue. Leave 315-319 blank if this item is entered.

Example: 314. 7152

315 Equatorial Inclination Angle (5)

Enter equatorial inclination angle (degrees).

Example: 315. 34.7

316 Apogee (5)

Enter apogee (kilometers).

Example: 316. 23500

317 Perigee

Enter perigee (kilometers).

	(5)	
		Example: 317. 200
318	Period of Orbit (7)	Enter period of orbit. If period is less than 24 hours, enter time in hours followed by letter "H." If period is 24 hours or more, enter the number of days, followed by letter "D." Example: 318. 19.6H
319	Number of Satellites (2)	Enter the number of nongeo-stationary satellites in the system. Example: 319. 1
321	Power Density (4)	For earth or space stations or terrestrial stations (including experimental) employing earth or space station techniques, insert the maximum power density per hertz (in dB_w) supplied to the antenna. For negative values insert a minus (-) before the value. For frequencies below 15 GHz, the power shall be averaged over the worst 4 kHz band; for frequencies 15 GHz and above, the power shall be averaged over the worst 1 MHz band. The worst 4 kHz and 1 MHz bands are defined as those having the highest power density within the assigned emission bandwidth. Example: 321. 8

TRANSMITTER EQUIPMENT

When both fixed and mobile station (FA/MA, FB/ML, etc.) are used, enter the fixed station transmitter data.

340 Equipment Nomenclature (1,18) (M)

Enter equipment type code followed by equipment component or system nomenclature for the transmitter location. Separate multiple entries with a slant bar. (Items 340 and 343 are interrelated and each entry in Item 340 should be accompanied by a corresponding entry in Item 343, if known.)

(a) Enter one of the listed equipment type codes:

G - Government nomenclature

C - Commercial model number

U - Unassigned nomenclature

Follow the equipment type code with a comma and enter the nomenclature subject to the following:

(b) For government equipment nomenclature, enter the standard military nomenclature following the equipment type code in (a) above.

Examples:

340. G,AN/GRC-103(V)
340. G,AN/FRT-96
340. G,AN/MRC-138/G,
AN/FRT-84

(c) If only a commercial model number is available, indicate the manufacturer of the equipment using the manufacturer code printed in Annex G of the NTIA Manual, followed by the model number. If no manufacturer's code exists, enter full text manufacturer in Item 801.

Example:

340. C,MOTH23FFN1130E

(d) If the nomenclature includes a modification, insert MOD and a number if applicable, immediately following the nomenclature. For the work MARK insert MK immediately following the nomenclature.

Example: 340. G,T238MK1

(e) If the transmitter does not have an assigned government nomenclature or commercial model number, enter in Item 801 the manufacturer's name and a short descriptive name of the equipment.

Example:

801. Collins Radio Experimental Radar.

341 Number of Equipments, System Name (5,18)

This is a two-element field. The first element (a) identifies the number of mobile and/or transportable certain fixed and mobile bands. The second element (b) shows the system name.

A station is one or more transmitters or receivers, or a

341 (Continued)

combination of transmitters and receiver, including the accessory equipment, necessary at one location for carrying on a radio communication service.

A system is two or more stations that have a common property, usually geographic, administrative, functional, or operational in nature.

In the bands 30-50, 138-144, 148-149.9, 150.05-150.8, 162-174, and 406.1-420 MHz, enter the number of land mobile stations, ship stations, and transportable stations associated with the assignment. (If desired these data may be entered on assignments, in other bands or for aircraft stations.)

The figure recorded for the number of stations shall represent either the exact number or range of numbers as follows:

Number of Equipments	Enter
1-10	10
11-30	30
31-100	100
101-300	300
301-1000	1000
1001-3000	3000
3001-10000	10000
Above 10000	nearest 10000

If the exact number is to be recorded, and it is 10, 30, 100, 300, 1000, 3000, or a multiple of 10000, add one to the number to distinguish it from a figure that represents a range of numbers.

System names shall be determined by the applicant. Those longer than 18 characters shall be abbreviated to a maximum of 18 characters.

The word "NET" may be used as the System Name.

Example: 341. 21,NET

Also, you may enter "N" if the assignment represents an entire system; enter "S" for all other cases.

Examples: 341. 31,N
341. XXXXX,S

343 Equipment Allocation Status (7)	Enter equipment J-12 allocation number (DD Form 1494) if known. (Items 340 and 343 are interrelated and each entry should be accompanied by a corresponding entry in item 340, if known.) Examples: 343. 1269 343. 0337/2 343. 1343/2032/2
345 Radar Tunability (2)	For all radars, enter one of the following symbols. FA - For frequency agile radars that operate on various frequencies within a band, either in a specified or random mode. FV - For radars that operate on a discrete frequency determined by the characteristics of a fixed magnetron or similar radio frequency generating device. FX - For radars capable of operating on a single discrete frequency

TC - For radars capable of being tuned to any frequency within the requested band.

TS - For radars capable of being tuned across the authorized or requested band in discrete steps or increments; includes crystal control.

Examples: 345. TC
345. FX

346 Pulse Duration (9 or 9-9) (M)

For all stations using pulsed emissions, insert numeric value(s) indicating the characteristic pulse duration(s) (PD) of the equipment at the half-power points. PD will be indicated in microseconds up to and including 999 microseconds and in milliseconds at one millisecond and above, adding the letter M at the end of the numeric value when expressed in milliseconds. Fractions may be shown to the nearest tenth by using a decimal.

For equipment having a capability for more than one discrete PD, insert the appropriate numerical values separated with a slant bar delimiter(/). For equipments having a capability for continuously variable PDs over wide ranges, insert upper and lower numerical values separated by a dash.

Examples: 346. 2M/6M
346. 1/3/5
346. 1M-25M/27M-50M

347 Pulse Repetition Rate (9 or 9-9)

For all stations using pulsed emissions, enter the numeric value(s) for the pulse repetition rate(s) (PRR) of the equipment. PRR will be indicated in pulses per second (PPS) up to and including 999 PPS and in thousands of pulses per second at 1000 PPS and above, adding the letter K after the numeric value. For assignments operating on more than one discrete PRR, insert the appropriate numerical values separated with a slant bar delimiter (/). For equipments having a capability for continuously variable PRRs over a wide range(s), insert upper and lower numerical values separated by a dash.

Examples: 347. 500/750/1K
347. 200-600

TRANSMITTER ANTENNA DATA	When both fixed and mobile stations (FA/MA, FC/MS, FB/ML, etc.) are used, enter the fixed station antenna data. If multiple antennas are used separately, enter data for the antenna used most frequently. Provide either name or nomenclature of other antennas. Use a slant bar to separate individual antenna data. NOTE 1: Items may be omitted for terrestrial stations at 29,890 kHz and above if for: (a) Experimental stations. (b) Mobile stations.
354 Antenna Name	Enter the name (type) of the antenna. Entry not required if application is: 1. Below 29,990 kHz 2. Space or earth station 3. See Note 1 above. Example: 354. PARABOLIC/HORN

355 Antenna Nomenclature (18)	If known, indicate military or commercial manufacturer antenna nomenclature or model number. Omit if antenna is part of a satellite transponder. This is a single occurrence field; enter the most used antenna. Example: 355. AS102
357 Antenna Gain (4)	Enter the antenna gain (in dB with reference to an isotropic source in the direction of maximum radiation. Gain must be entered if Item 354 is entered. Gain may be omitted on applications for terrestrial stations at: 1. Below 29,990 kHz if for other than fixed (FX) and aeronautical fixed (AX) stations in the 3000 to 29,990 kHz band. 2. See Note 1 above. For a space station, the gain of up to three antennas may be shown with the respective gains separated by a slant bar. For a negative gain (earth and space station only), enter a dash before the value of gain. Examples: 357. 10 357. 20/18/30
358 Antenna Elevation (5)	Enter the site (terrain) elevation in meters above mean sea level (MSL). Entry not required if application: 1. Below 29,890 kHz. 2. For terrestrial stations

	at 29,890 kHz and above if for (a) mobile stations or (b) telecommunication lasers. Example: 358. 980
359 Antenna Feed Point Height (5)	Enter the antenna "feed point" height in meters above surrounding terrain. Entry not required if application: 1. Below 29,890 kHz. 2. See Note 1 above. Example: 359. 10
360 Antenna Beamwidth (4)	For space, earth, or terrestrial stations (including experiential) employing space or earth station techniques, enter the antenna beamwidth (degrees) at the half power points. For a fractional beamwidth, prefix the decimal with a zero. For a space station, the beamwidth of up to three antennas may be shown with the respective beamwidths separated by a slant bar. Examples: 360. 0.5 360. 12/20/30 360. 17.2
362 Antenna Orientation (3) (7)	TERRESTRIAL ANTENNA: Enter the 3-digit azimuth in degrees from true north or one of the codes listed below for the transmitter antenna. <u>ANTENNA CODES</u>: S = Fixed direction but steerable in the horizontal plane.

<u>ANTENNA CODES</u> (Contd.):

ND = Nondirectional.

R = Rotating through 360 degrees.

SSH = Scanning horizontally through a limited sector.

SSV = Vertical scanning (nodding).

T = Tracking that can observe a moving object.

Examples: 362. 225
362. ND

EARTH STATION: Enter the antenna's minimum operating elevation in degrees consisting of "V" followed by a two-digit value. Follow the vertical data with a comma and azimuth in degrees from true north to the geostationary satellite. For two nongeostationary satellites, enter the azimuth to each separated by a slant bar. For more than two nongeostationary satellites, enter the maximum range of the azimuth angle separated by a " - " (dash). If the earth station must communicate with more than one geostationary satellite, create an additional record.

Examples: 362. V09,133
362. V10,132/150
362. V12,122-160

SPACE STATION: Enter either "NB" for narrow beam or "EC" for earth coverage.

Example: 362. EC

363 Antenna Polarization (1)	Enter the polarization of the antenna using the following symbols:

CODE	POLARIZATION
D	Rotating
E	Elliptical
F	45 Degree
H	Fixed Horizontal
J	Linear
L	Left-hand circular
R	Right-hand circular
S	Horizontal and vertical
T	Right and left circular
V	Fixed vertical
X	Other or unknown

Example: 363. V

For space station, polarization may be listed for up to three antennas.

Example: 363. F/J/L

RECEIVER LOCATION DATA	When multiple occurrences of receiver location data occur, the data entries must correspond in the same sequence throughout; that is, proper alignment of multiple occurrence entries must be maintained so each specified data item will be associated with the correct receiver. Additionally, each set of equipment and antenna data must associate with a particular occurrence of a receiver location site.

When more than one receiver location is involved, the corresponding data in the items will be designated as R01 or R02, etc. For example, 401. TAMPA,R01 MIAMI,R02, designates location of receiver number one in TAMPA and receiver number two in MIAMI.

400 State/Country (4)	Enter the name or abbreviation of the state, country, or area in which the receiving antenna is located. (Refer to Annex G for state/country abbreviations.)
401 Antenna Location (24) (M)	Enter name of city, base, or geographical area where the transmitter antenna is located. Abbreviate if necessary; however, if abbreviation is not required, the entry should be spelled the same as in the U.S. Postal Zip Code Directory or applicable gazetteer. If the abbreviated entry has not been previously used, also enter the unabbreviated spelling in Item 801 for review by the assignment authority. After being entered the first time, all future entries for that same location should use the same spelling. In certain cases nongeographical entries may be used; e.g., MOON, MISSILE, AIRCRAFT, SHIPS, GEOSTATIONARY or NONGEOSTATIONARY. For mobile or transportable applications, see Data Items 406, 530, and 531. In addition to the above, the following will apply: a. Use the same spelling/ abbreviation as that used in

Item 400, if applicable.

b. The following standard abbreviations will be used even if the entry is less than 24 characters.

Location Word	Abbreviation
Army Area	ARA
Camp	CP
Coast Guard District	CGD
City	CY
District	DI
Division	DIV
Fort	FT
Island(s)	IS
Large Navigational Buoy	LNB
Mont, Monte, Mount(s)	MT
Mountain(s)	MTN
Proving Ground(s)	PG
Point	PT
Saint	ST

Examples: 401. FT BRAGG
401. NASHVILLE
401. NONGEOSTATIONARY

402 Receiver Operating Unit (18)

Enter the name or designation of the organization using the frequency assignment at the receiver site if different from data entered in Item 207.

Example: 402. HMX1

403 Antenna Coordinates (15)

Enter geographical coordinates (degrees, minutes, and seconds) for the antenna location. For geostationary satellite, enter longitude only. If station is aboard a non-geostationary satellite, leave both latitude and longitude blank. If the seconds are not known, insert XX for the seconds, except in the case of the NAVAIDS and microwave facilities. Use

	leading zeros as appropriate for degrees, minutes, or seconds. Degrees latitude require two digits; degrees longitude require three digits. Leave the item blank if the site named in receiver ANTENNA LOCATION is an area for which coordinates cannot be applied. Enter N or S for latitude E or W for longitude.
404 Call Sign (6)	This item is for the international call sign assigned to the receiving station. If local voice, tactical, or not applicable, leave blank. For navigational aids, this item is for the identifier instead of a call sign.
406 Authorized Radius (4)	If applicable, enter the radius (in kilometers from the coordinates entered in Item 403) to describe the area in which the receiver station will operate. (Note: When both fixed and mobile stations will operate on the same frequency, an entry in this item indicates the mobile station will be transmitting within the area described.)
407 Path Length (5) ***	This is a computer generated output item. It is the distance between the transmitter and receiver(s) expressed in kilometers for terrestrial stations in the Fixed Service between 4 and 30 MHz.

408 Repeater Indicator (1)	Enter the letter "R" for each receiver location when a station in the fixed or mobile service is used primarily as a repeater. (Applicable only between 30-420 MHz.) Example: 408. R
SPACE STATIONS	Items 414 through 419 are to be used for unique space station data. Leave Items 415 through 419 blank for geostationary satellites.
414 SDC Object Number (5)	If known, enter the Space Defense Center (SDC) object number as listed in the SDC catalogue. Leave 415-419 blank if this item is entered.
415 Equatorial Inclination Angle (4)	Enter equatorial inclination angle (degrees).
416 Apogee (5)	Enter Apogee (kilometers).
417 Perigee	Enter Perigee (kilometers).
418 Period of Orbit (7)	Enter period of the orbit. If period is less than 24 hours, enter time in hours followed by "H." If period is 24 hours or more, enter the number of days, followed by "D."
419 Number of Satellites (2)	Enter the number of nongeostationary satellites in the system.

419 Number of Satellites (Contd.)

RECEIVER EQUIPMENT	When both fixed and mobile stations (FA/MA, FC/MS, etc.) are used, enter the fixed receiver data.
440 Equipment (1,18)	Enter equipment type code followed by equipment component or system nomenclature for the receiver location. Separate multiple entries with a slant bar.

(a) Enter one of the listed equipment type codes:

G - Government Nomenclature

C - Commercial model number

U - Unassigned nomenclature

Follow the equipment type code with a comma, and enter the nomenclature subject to the following:

(b) For government equipment nomenclatures, enter the standard military nomenclature following the equipment type code in (a) above.

(c) If only a commercial model number is available, indicate the manufacturer of the equipment using the manufacturer codes printed in Annex G of the NTIA Manual, followed by the model number, or enter full text manufacturer in Item 801.

(d) If the nomenclature includes a modification, insert MOD and a number, if applicable, immediately following the nomenclature. For the word MARK, insert MK immediately following the nomenclature.

(e) If the receiver does not have an assigned government nomenclature or commercial model number, enter in Item 801 the abbreviated manufacturer's name and a short descriptive name of the equipment.

443 Equipment Allocation Status (7) (M)	Enter the equipment's J-12 allocation number (DD Form 1494) if known. (Data Items 440 and 443 are interrelated and each entry in Data Item 443 must be accompanied by a corresponding entry in Data Item 440.) Examples: 443. 1269 443. 0377/2
RECEIVER ANTENNA DATA	Receiver antenna data is required for space and earth stations, fixed (point-to-point), and fixed station receivers or repeaters to which a mobile station transmits. (In other instances, data entry is optional.) NOTE 1: Items may be omitted for terrestrial stations at 29,890 kHz and above for (a) experimental stations, (b) mobile stations, and (c) telecommunication lasers.

454	Antenna Name (10)	Enter the name (type) of the antenna. Entry not required if application is: 1. Below 29,990 kHz. 2. Space or earth station. 3. See Note 1 above.
455	Antenna Nomenclature (18)	Indicate military or commercial manufacturer antenna nomenclature or model number. Omit if antenna is part of satellite transponder. This is a single occurrence field; enter the most used antenna.
457	Antenna Gain (4)	Enter the antenna gain (in dB with reference to an isotropic source) in the direction of maximum radiation. See Note 1 above. Gain is also required for fixed (FX) and aeronautical fixed (AX) stations in the 3000 to 29,990 kHz band. For a space station, the gain of up to three antennas may be shown with the respective gains separated by a slant bar. For a negative gain (earth and space station only), enter a dash before the value of gain.
458	Antenna Elevation (5)	Enter the site (terrain) elevation in meters above mean sea level (MSL). See Note 1 above.
459	Antenna Feed Point Height (5)	Enter the antenna "feed point" height in meters above terrain. See Note 1 above. 1. Below 29,890 kHz 2. See Note 1 above

460 Antenna Beamwidth (4)	For space, earth, or terrestrial stations (including experimental) employing space or earth station techniques, enter the antenna beamwidth (degrees) at the half power points. For a fractional beamwidth, prefix the decimal with a zero. For a space station, the beamwidth of up to three antennas may be shown with the respective beamwidths separated by a slant bar.
462 Antenna Orientation (3, 7)	TERRESTRIAL ANTENNA: Enter the azimuth in degrees from true north or one of the codes listed on next page for the receiving antenna:

ANTENNA CODES:

S =	Fixed direction but steerable in horizontal plane.
ND =	Nondirectional.
R =	Rotating through 360.
SSH =	Scanning horizontally through a limited sector.
SSV =	Vertical scanning (nodding).
T =	Tracking that can observe a moving object.

Examples: 462. 225
462. ND

EARTH STATION: Enter the antenna's minimum operating elevation in degrees consisting of "V" followed by a two-digit value. If the earth station is fixed and is to communicate with a single geostationary satellite, follow the vertical data with a comma and the azimuth in degrees from true north to the satellite. If the earth station is mobile or transportable, or if the earth station is to communicate with a non-geostationary satellite, follow the vertical data with a comma and the maximum with more than one satellite, a separate assignment must be added.

Examples: 462. V09,133
462. V10,132/150
462. V12,122-160

SPACE STATION: Enter either "NB" for narrow beam or "EC" for earth coverage.

463 Antenna Polarization (1)

Enter polarization of the antenna using the following symbols:

CODE	POLARIZATION
D	Rotating
E	Elliptical
F	45 degree
H	Fixed horizontal
J	Linear
L	Left-hand circular
R	Right-hand circular
S	Horizontal and vertical
T	Right and left circular
V	Fixed vertical
X	Other or unknown

For a space station, polarization may be listed for up to three antennas.

SPACE SYSTEMS	Items 470 through 499 are to be used for unique space system data.
470 Space Station Receiving Noise Temperature (5)	Enter the space receiving station noise temperature in degrees Kelvin. If more than one receiver antenna was reported, enter value for each antenna, separated by a slant bar. Example: 470. 200/300/150 When multiple receiving space stations are reported, follow the noise temperature data with the number of the associated receiver location. Example: 470. 200/300/150,R01
471 Earth Station Receiving System Noise Temperature (5)	Enter the earth receiving system noise temperature in degrees Kelvin. Example: 471. 60 When multiple receiving earth stations are reported, enter the noise temperature for each earth station followed by the number of the associated receiver location. Example: 471. 60,R01 100,R02
472 Equivalent Satellite Link Noise Temperature (5)	This entry is required for each receiving earth station that receives signals from a space station involving a frequency changing transponder. All satellite links that involve a receiving earth station must be considered in determining the lowest equivalent satellite link noise.

Enter noise temperature in degrees Kelvin, taking into consideration all satellite links received by the earth station on the frequency indicated.

Example: 472. 96

SUPPLEMENTARY DETAILS

These items are for data not specifically covered elsewhere.

500 IRAC Notes
(4)
**

(For US&P only.) Enter IRAC note numbers separated by a slant bar. Enter M Notes with details in Item 501.

Example: 500. S362

501 Notes-Free Text
(35)
**

This item identifies M Notes including amplifying data associated with each note.

For each M-note, include up to 35 characters by entering the M-note, a comma, and the associated amplifying text. Do not enter more than one M-note per data line.

Examples:

501. M005,ROCKVILLE,MD
501. M003,WRCTV,Washington,
DC/John Smith
501. M003,(202)841-5121

502 Description of
Requirement
(1440)

This data is not processed to IRAC. Give a general description of the requirement indicating specific use of the frequency(ies) or band(s). Include other remarks as appropriate and also include reason for modification/deletion to any of the particulars of the assignment.

	It is not necessary to duplicate data entered in Item 503/520.
503 Agency-Free Text Comments (35) **	The Agency-Free Text Comments data item is to record agency data pertinent to the proposed assignment intended to be a part of the application processed through IRAC. Enter up to 35 characters for each line of remarks. Precede each new data line with the item ID and do not enter more than 35 characters on any one line. (Agency remarks not to be processed through the IRAC should be entered in the remarks Data Item 502.) Example: 503. WIRELESS MICROPHONE
504 FAS Agenda or OUS&P Comments (72) (M)	This is used whenever it is necessary to provide information which is not necessary to be recorded in the GMF. The data entered will appear in the FAS Agenda (ACTF) file and the FRRS temp files only. It will not appear in the GMF or FRRS master files. A maximum of five occurrences is permitted. Example: 504. Telephone Action 504. Five-Year Review Update
520 Supplementary Details (1200) **	This data item is a free-text item, which includes the following data, as appropriate, plus any additional amplifying information that would facilitate or expedite the processing of this transaction.

a. Frequency Diversity.

b. Sounder justification.

c. Refer to NTIA Manual, Chapter 9, for further details.

Enter as many data lines as necessary to give a general description of the requirement, indicating specific use of the frequency(ies) or band(s).

Example:

520. NAVY MARINE CORPS MARS COMM.

530 Authorized Areas (3, 35)

The AUTHORIZED AREAS data item is used to describe areas that cannot be described under Authorized Radius or Authorized States.

If the Antenna Location data Item(s) 301 and/or 401 is the name of the state/country or USA, a part of a state/country or parts of several contiguous state/countries may be entered here (for a particular transmitter or receiver location, do not enter data here if the Authorized States Data Item 531 is used). The following identifying codes are available:

ART - for transmitting in area shown.
ARR - for receiving in area shown.
ARB - for transmitting and receiving in area shown.

For each entry, enter the identifying code followed by a comma and the data concerning the area, using the abbreviation as shown in NTP 6, Annex G. Use the letter N for north, S for south, E for east, and W for west when describing areas by latitude and longitude. Separate elements by comma.

Examples:

530. ART,SW WY,NE,UT,NEW,CO
530. ARR,S OF 33N
530. ARB,39N43N098W099W
530. ART,S OF 40N,E OF 095W

531 Authorized States (3, 4, 4, ... 4)

For US&P only. The Authorized States Data Item is provided to include or exclude states whenever the transmitter and/or receiver antenna location is specified as an area of operation with several states.

If the Antenna Location and/or Data Item(s) 301 and/or 401 is specified as US, USA, or USP for an area of operation within several states, enter the states to be included or excluded. (For a particular transmitter or receiver location, do not enter data here if the Authorized Areas Data Item 530 is used.) The following identifying codes are available:

LST - for transmitting in the states listed.
LSR - for receiving in the states listed.
LSB - for transmitting and receiving in the

		states listed.
	EST -	for transmitting and receiving in the states listed.
	ESR -	for receiving in all states except those listed.
	ESB -	for transmitting and receiving in all states except those listed.

The states specified within a given data item entry must be separated by a comma. All specified entries/occurrences must be preceded by one of the above identifying codes followed by a comma. Use the state abbreviations as shown in NTP 6, Annex G.

Example: 531. LST,CA,OR,WA

OTHER ASSIGNMENT IDENTIFIERS	As required.
701 Frequency Action Officer (3) **	Enter the identification of the person or group at NAVEMSCEN responsible for the assignment. Example: 701. 321
702 Control/Request Number (15)	Enter organizational control number as directed by the responsible agency or CINC. This item permits subordinate organizations to track proposals. Example: 702. NESC 90-007 In Europe use EUCOM Case Number. Use leading zeroes as needed. Example: 702. NAVEUR87-XXX

704 Type of Service (2)

Army enter the code for type of service.

Example:

704. WW (Radiolocation)

CINCEUR units enter the type of circuit code from the list below:

S - Simplex
D - Duplex
H - Semiduplex
Z - Simplex net
T - One directional transmission
B - Broadcast
M - Simultaneous broadcast
N - Radionavigation
L - Radiolocation
R - Reception only
X - Radiodetermination

Example: 704. N

705 System Identifier (35)

Required for IRAC assignments using frequency bands 29.89-50.0, 162.0-174.0, or 406.1-420.0 MHz if the assignment does not contain IRAC Note S322 in Item 500. Entry is optional for all other assignments.

If the assignment will be used for more than one purpose or function, enter the one that is most important. If two or more are equally important, choose the one that will be used most often and enter the other(s) as amplifying data. Enter one of the system additional amplifying information, if necessary. The entire entry may not exceed thirty-five (35) characters in length.

Function or Purpose

Administrative
Air Traffic Control
Backbone
Commander
Construction
Executive
Fire
Hydrologic
Inspection
Law Enforcement
Maintenance
Medical
Misc
Mobile Telephone
Natural Resources
Navaids
Navaids Control
Paging
RDT&E Support
Seismic
SMR
Special Courier
Survey
Telecommand
Test Range
Training
Transportation
Trunking
Utilities
Weather
Wireless Mike

Examples:

705. FIRE
705. TRANSPORTATION,TAXI DISPATCH
705. CONSTRUCTION, MAINTENANCE

707 USCINCPAC Complement/ ARFA Function Number (8) (M)	USCINCPAC - Enter the number used to identify a family grouping of frequencies that have a like or similar use. USCINCEUR - Enter the function number(s) used by the Allied

Radio Frequency Agency (ARFA) to specify the operational use of all frequencies in the 100-156, 225-400, and 960-1215 MHz bands.

Examples:

707. 341-100 (USCINCPAC)
707. 100/101 (USCINCEUR)

710 Host Country Docket Number (12)

Enter the docket number assignment by the soil (host) country to the frequency authorization.

Example: 710. F64-171

711 Aeronautical Service Range and Height (6) (S)

Provide flight level and service range of all aeronautical navigational aids and air traffic control assignments for frequencies above 29,890 kHz and low-frequency beacons. Enter service range (in nautical miles) using three digits allowed by flight level (in thousands of feet) using three digits. The example indicates a 250-mile range at 50000 feet.

Example: 711. 250085

715 Transmitter ARFA MRFL Number (6)

Enter the transmitter ARFA MRFL serial number of the frequency assignment in this message as recorded in the ARFA MRFL.

Example: 715. 821234

716 Usage Code (1)

Required for USCINCEUR, optional for all others. Enter one of the following codes:

1 - Wartime circuits required to be operated or to be ready for operation in

peace time (terminals fully equipped with appropriate installation and personnel).

2 - Wartime circuits having in peace time a limited capability for exchanging traffic between the planned terminals (equipment and personnel shared with other "2" circuits).

3 - Required for wartime only (equipment is, or will be available).

4 - Required for occasional and temporary usage for training exercises or maneuver purposes, and for peace time emergencies, when a category of the above circuits cannot be used or does not exist to meet such occasional needs.

5 - Required for the deployment phase of contingency operations.

6 - Required for the employment phase of contingency operations.

7 - Required for peace time only.

8 - Other. Provide explanation (proposals only).

Example: 716. 3

ADDITIONAL INFORMATION (Data that will not be stored in the record.)

801 Coordination Data/ Remarks	List agencies with whom coordination has been effected; (i.e., FAA, GAFC, etc.), and include any remarks that may be appropriate for processing the assignment. Example: 801. GAFC/GAFC MSG 021200Z AUG 82
803 Requestor Data (60) (S)	Provide name and phone number of individual submitting request.
804 Tuning Range Increments (60)	Required for USCINCEUR, optional for all others. Enter the tuning range of the equipment. Enter units followed by lower and upper frequency list of the equipment. Separate frequencies with a "-" (dash). Also enter one of the following to indicate the largest tuning increments of the frequency(ies) listed in Item 110. Separate entries with a comma. <u>COMMON TUNING INCREMENTS</u>: Continuously tunable 10 Hz 100 Hz (.1 kHz) 500 Hz (.5 kHz) 1 kHz 5 kHz 10 kHz 12.5 kHz 20 kHz 25 kHz 50 kHz 75 kHz 100 kHz 125 kHz 200 kHz 250 kHz

<u>COMMON TUNING INCREMENTS</u>: (Contd.)

500 kHz
1 MHz (1000 kHz)
Crystal (not tunable)
Other (explain with text)

Example: 804. M250-300,100 kHz

805 Date Response Required (6) (S)

Required only on frequency proposals to be processed within the European theater. Enter the date by which either an assignment or nonassignment of requested frequencies is required to provide notifications to potential users. Except in unusual circumstances, this date should be at least 65 days from the date of message release or initial request date. List the date as year (YY), month (MM), and day (DD).

Example: 805. 820315

806 Indication If Host Nominations Are Acceptable (Text)

Required by USCINCEUR. Optional for all others. Enter YES followed by a statement indicating band limitations and channelization requirements if HOST NATION nominations are acceptable to fulfill the requirement. Enter NO followed by the reason if other nominated frequencies cannot be used.

Example:

806. YES, BAND LIMITATIONS
ARE...

807 Frequencies To Be Deleted (Text)

Required only on frequency proposals to be processed within the European theater. List the frequencies that can be deleted upon assignment of the requested frequencies along

807 Frequencies To Be Deleted (Text) (Contd.)

with USCINCEUR Frequency Liaison Office, Brussels, Belgium, and/or FRG case numbers and MRFL number when available. Leave blank if no frequencies will be deleted.

Example: 807. K14.5,NAVEUR81-266,F61-836,131101

ANNEX D-1

GUIDE TO STANDARD FREQUENCY ACTION FORMAT (SFAF)

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
ADMINISTRATIVE DATA				
005	Security Classification	2,6	S	Yes
006	Security Classification Modification	2,6	S	Yes
010	Type of Action	1(12)[a]	S	Yes
020	Proposal References	64	M	No
102	Agency Serial Number	12	S	Yes
103	IRAC Docket Number	8	M	No
104	Assignment Authority	15	M(30)	No
105	List Serial Number	10	S	Yes
106	Serial Replaced, Delete Date	10,6	S	Yes
108	Docket Numbers of Older Authorizations	35	M(30)	Yes
EMISSION CHARACTERISTICS				
110	Frequency(ies)	11 or 11-11 or 11(11)	S	Yes
111	Excluded Frequency Band	23	M(30)	Yes
113	Station Class	4	M(20)	Yes
114	Emission Designator	11	M(20)	Yes
115	Transmitter Power	9	M(20)	Yes
TIME/DATE INFORMATION				
130	Time	4 or 1(4)	S	Yes
140	Required Date	6	S	No
141	Expiration Date	6	S	Yes
142	Review Date	6	S	No
144	Record Indicator	1	S	No
145	IFRB Registration	1	S	No
146	DIS Trunk ID	6	M(30)	No
147	Joint Agencies	4	M(30)	Yes

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
151	Coordination Indicator	1	S	Yes
152	Coordination Data	1,35	M(30)	Yes

ORGANIZATION INFORMATION

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
200	Agency	6	S	No
201	Unified Command	8	M(30)	No
202	Unified Command Service	8	M(30)	No
203	Bureau	4	S	Yes
204	Command	8	S	No
205	Subcommand	8	S	No
206	Installation Frequency Manager	18	S	No
207	Operating Unit	18	M(30)	No
208	User Net/Code	6	S	Yes
209	Area AFC/DoD AFC/Other Organizations	18	M(30)	No

TRANSMITTER LOCATION DATA

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
300	State/Country	4	S	Yes
301	Antenna Location	24	S	Yes
302	Station Control	18	S	Yes
303	Antenna Coordination	15	S	Yes
304	Call Sign	6	S	Yes
306	Authorized Radius	5	S	Yes

SPACE STATIONS

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
314	SDC Object Number	5	S	No
315	Equatorial Inclination Angle	4	S	Yes
316	Apogee	5	S	Yes
317	Perigee	5	S	Yes
318	Period of Orbit	7	S	Yes
319	Number of Satellites	2	S	Yes
321	Power Density	4	S	Yes

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
TRANSMITTER EQUIPMENT				
340	Equipment Nomenclature	1,18	M(30)	Yes
341	Number of Equipments, System Name	5,18	S	Yes
343	Equipment Allocation Status	7	M(30)	Yes
345	Radar Tunability	2	M(30)	Yes
346	Pulse Duration	9 or 9-9	M(30)	Yes
347	Pulse Repetition Rate	9 or 9-9	M(30)	Yes
TRANSMITTER ANTENNA DATA				
354	Antenna Name	10	S	Yes
355	Antenna Nomenclature	18	S	Yes
357	Antenna Gain	4	M(30)	Yes
358	Antenna Elevation	5	S	Yes
359	Antenna Feedpoint Height	5	S	Yes
360	Antenna Beamwidth	4	M(30)	Yes
362	Antenna Orientation	3,3 or 3,3-3 or 3, 3/3	M(30)	Yes
363	Antenna Polarization	1	M(30)	Yes
RECEIVER LOCATION DATA				
400	State/Country	4	M(30)	Yes
401	Antenna Location	24	M(30)	Yes
403	Antenna Coordinates	15	M(30)	Yes
404	Call Sign	6	M(30)	Yes
406	Authorized Radius	4	M(30)	Yes
407	Path Length	5	M(30)	No
408	Repeater Indicator	1	M(30)	Yes

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
SPACE STATIONS				
414	SDC Object Number	5	M(30)	No
415	Equatorial Inclination Angle	4	M(30)	Yes
416	Apogee	5	M(30)	Yes
417	Perigee	5	M(30)	Yes
418	Period of Orbit	7	M(30)	Yes
419	Number of Satellites	2	M(30)	Yes
RECEIVER EQUIPMENT				
440	Equipment Nomenclature	1,18	M(30)	Yes
443	Equipment Allocation Status	7	M(30)	No
454	Antenna Name	10	M(30)	Yes
455	Antenna Nomenclature	18	M(30)	Yes
457	Antenna Gain	4	M(30)	Yes
458	Antenna Elevation	5	M(30)	Yes
459	Antenna Feedpoint Height	5	M(30)	Yes
460	Antenna Beamwidth	4	M(30)	Yes
462	Antenna Orientation	3 or 3,3 or 3,3-3	M(30)	Yes
463	Antenna Polarization	1	M(30)	Yes
SPACE SYSTEMS				
470	Space Station Receiving Noise Temperature	5	M(30)	Yes
471	Earth Station Receiving System Noise Temperature	5	M(30)	Yes
472	Equivalent Satellite Link Noise Temperature	5	M(30)	Yes

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
SUPPLEMENTARY DETAILS				
500	IRAC Notes	4	M(10)	Yes
501	Notes--Free Text	35	M(30)	Yes
502	Description of Requirement	1440	S	No
503	Agency--Free Text Comments	35	M(30)	Yes
504	FAS Agenda or OUS&P Comments	72	M(5)	Yes
520	Supplementary Details	1200	S	Yes
530	Authorized Areas	3,35	M(30)	Yes
531	Authorized States	3,4	M(30)	Yes
OTHER ASSIGNMENT IDENTIFIERS				
701	Frequency Action Officer	3	S	Yes
702	Control/Request Number	15	S	Yes
704	Type of Service	2	S	Yes
705	System Identifier	24,32[b]	S	Yes
707	USCINCPAC Complement Number	8	S	No
710	Host Country Docket Number	12	M(30)	No
711	Aeronautical Service Range and Height	6	S	No
714	ARFA Function Number	3	M(30)	No
715	Transmitter ARFA MRFL Number	6	S	No
716	Usage Code	1	S	No
ADDITIONAL INFORMATION				
801	Coordination Data/ Remarks	60	M(30)	No
803	Requestor Data	60	S	No
804	Tuning Range/ Tuning Increments	60	M(30)	No

SFAF Item No.	Title	Input Length	Occurrences (Limit)	Forwarded to NTIA
805	Date Response Required	6	S	No
806	Indication if Host Nominations are Acceptable	60	M(30)	No
807	Frequencies to be Deleted	60	M(30)	No

[a]The number "12" within parentheses applies to the Copy type of action.

[b]Maximum of 35 characters including spaces and the comma.

ANNEX D-2

ABBREVIATED REQUESTS (1)

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	346 (4)
010	347 (4)
020	354
110	357
113	400
114	401
115	403
140	406 (2)
141	454
147 (6)	502
200	701
206	702
207	704 (6)
208	711 (5)(6)(7)
209	716 (6)
300	801 (5)
301	803
303	804 (6)
306 (2)(6)(7)	805 (6)
340 (3)	806 (6)

NOTES:

(1) This format may be followed for proposals/assignments for frequency requirements when (a) the period of the requirement will not exceed 90 days and (b) the requirement is for other than a station in the space service.

(2) If applicable.
(3) Include nomenclature or name if nomenclature is unknown.
(4) Include for pulsed emitters.
(5) Include for Aeronautical Navigational Aid and Air Traffic Control.
(6) Include for Europe.
(7) Include for Canada.

ANNEX D-3

REQUESTS BELOW 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	304
010	306 (1)
020	340
102	343
110	357 (3)
113	362 (3)
114	400
115	401
130	403
140	404 (2)
141 (1)	406 (1)
144	440
200	443
206	457 (3)
207	462 (3)
208	502
209	701
300	702
301	711 (1)
303	803

NOTES:

(1) If applicable.

(2) For fixed receiver location only.

(3) Required for fixed (FX) and aeronautical fixed (AX) (fixed receivers only).

ANNEX D-4

FIXED STATIONS TO FIXED STATIONS-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	355
010	357
020	359
102	362
113	363
114	400
115	401
130	403
140	408 (1)
141 (2)	440
144	443
200	454
206	455
207	457
208	458
209	459
300	462
301	463
303	502
340	701
343	702
354	801
	803

NOTES:

(1) Used if receiver is a repeater.

(2) Experimental or temporary.

ANNEX D-5

FIXED STATIONS TO MOBILE STATIONS-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	343
010	354
020	355
102	357
110	358
113	359
114	362
115	363
130	400
140	401
141 (3)	403
144	406
200	440
206	443
207	502
208	530 (1)
209	531 (1)
300	701
301	702
303	711 (2)
340	801
341	803

NOTES:

(1) 530, 531 as required.

(2) For aeronautical services only.

(3) Experimental or temporary.

ANNEX D-6

MOBILE STATIONS TO FIXED STATIONS-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	340
010	341
020	343
102	400
110	401
113	403
114	408 (1)
115	440
130	443
140	454
141 (2)	455
144	457
200	458
206	459
207	462
208	463
209	502
300	701
301	702
303	801
306	803

NOTES:

(1) Used if receiver is a repeater.

(2) Experimental or temporary.

ANNEX D-7

MOBILE STATIONS TO MOBILE STATION-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	300
010	301
020	303
102	306
110	340
113	341
114	343
115	400
130	401
140	403
141 (2)	440
144	443
200	502
206	530 (1)
207	531 (1)
208	701
209	702
	801
	803

NOTES:

(1) 530,531 as required.

(2) Experimental or temporary.

ANNEX D-8

RADAR STATION-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	303
010	340
020	343
102	345
110	346
113	347
114	354 (1)
130	357 (1)
140	359 (1)
141 (2)	362 (1)
144	363 (1)
200	400
206	401
207	403
208	502
209	701
300	702
301	801
	803

NOTES:

(1) Not required, mobile radars.

(2) Experimental or temporary.

ANNEX D-9

EARTH TO SPACE-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM	ITEM
005	306 (1)	414 (2)
010	314	415 (2)
020	315	416 (2)
102	316	417 (2)
110	317	418 (2)
113	318	419 (2)
114	319	440
115	321	443
130	340	457
140	343	460
141	354	462
144	357	463
200	358	470
206	359	472
207	360	502
208	362	701
209	363	702
300	400	711 (3)
301	401	801
303	403	803

NOTES:

(1) For transportable/mobile earth stations (i.e., GMF maritime or aeronautical mobile earth stations or land mobile).

(2) Required for nongeostationary satellites.

(3) For an earth station aboard an aircraft, insert a two-digit number followed by the letter K to denote the maximum operational altitude of the aircraft in thousands of meters above mean sea level. For altitudes under 10,000 meters, insert the leading zero.

ANNEX D-10

SPACE TO EARTH-ABOVE 30 MHz

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM	ITEM
005	303	440
010	314 (1)	443
020	315 (1)	454
102	316 (1)	455
110	317 (1)	457
113	318	458
114	319 (1)	459
115	321	460 (2)
130	321	462
140	343	463
141	357	471
144	360	472
200	362	502
206	363	701
207	400	702
208	401	711
209	403	801
300	406	803
301		

NOTES:

(1) Required if nongeostationary.

(2) For an earth station aboard an aircraft, insert a two-digit number followed by the letter K to denote the maximum operational altitude of the aircraft in thousands of meters above mean sea level. For altitudes under 10,000 meters, insert the leading zero.

ANNEX D-11

MODIFICATION PROPOSAL

*** This SFAF message must be vertically-formatted. It is displayed in this multi-column fashion for this example.

ITEM	ITEM
005	300
006 (1)	301
010	502 (2)
020	701
102	702
110	801 (3)
141 (1)	803
144	

NOTES:
The above listed items are minimally required and any items required in Annexes D-3 through D-10 that are outdated/incorrect/missing must also be included. Additionally, include all other items to be modified in numerical sequence with the new information.

(1) If required.
(2) Reason for modification and coordination, if required.
(3) Optional.

EXAMPLE OF MODIFICATION

```
      005. U
      010. M
      020. NFCWUS 011430ZNOV91
      102. N860056
      110. M118.6
*     113. FAC
*     114. 6K00A3E
*     115. W25
      144. Y
*     206. NASFALLON
      300. NV
*     301. FALLON
*     303. 362500N1261109W
*     340. G,AN/GRT-21
*     343. 2935/2
*     357. 0
```

* 358. 1953
* 403. 362500N1261109W
* 406. 25
* 502. APPROACH CONTROL
* 504. ASGMT UPDATE. TX SITE RELOCATED,EQUIP UPGRADED, ATC AREA REDUCED.
520. $
* 520. COORD WITH FAA WP RGN. AWP-900069 APPLIES.
701. 323
* 702. NCEP90-999
* 803. RMC GIGAHERTZ, DSNXXX-YYYY.

* Denotes updated/changed/missing data associated with this modification action.

ANNEX D-12

DELETION PROPOSAL

Item

005

010

020

102

110

144

300

301

502 (1)

701

702

803

NOTE:

(1) Reason for deletion.

ANNEX D-13

RENEWAL

ITEM

005

010

020

102

110

141 (1)

144

300

301

502 (2)

701

702 (3)

801 (4)

803 (3)

NOTES:

(1) See Annex D, paragraph 18, Item 141 for more particulars.

(2) Enter only new data; otherwise, not required.

(3) Enter new control/request number.

(4) Required only if assignment technical parameters are modified which would require recoordination with affected agencies; i.e., power, emission, transmit antenna, etc.

ANNEX E

FREQUENCY SCHEDULING

E101. GENERAL

a. Frequency assignments to the unified commander (afloat naval, fixed-plant outside of the US&P, or ship/shore/ship) or to a naval shore facility (fixed-station-ashore US&P) are made with two sets of constraints. Frequencies are assigned to the fixed-station-ashore commands for a specific use on a particular emitter at a fixed location. Once the assignment is made, no flexibility exists in the use of the frequency.

b. The remaining frequencies are assigned to the unified commander for appropriate naval use. The ship/shore/ship frequencies are assigned with specific shore stations allowed to transmit them, and subassignment is made by the controlling agency in each area of the Naval Telecommunication Systems (NTS). Subassignment decisions are based on the ability of the particular combinations of approved transmitter, site locations, and frequencies to propagate in support of the requirement being met. The unified commander subassigns these frequencies to the Fleet Commander-in-Chief (FLTCINC), who subassigns them to a Naval Computer Telecommunication Area Master Station (NCTAMS) for concurrent subassignment to Naval Computer Telecommunication Stations (NAVCOMTELSTAs) and to ships at sea for use. This process is described in a later section.

c. The afloat naval frequencies used in the open sea by surface and submarine units and aircraft are also assigned to the unified commander for naval use. These frequencies, which include satellite access, TACANs, and an assortment of tactical frequencies in the HF, VHF, UHF, and SHF bands, are subassigned by the unified commander to the FLTCINC for further subassignment. The FLTCINC, in turn, subassigns sets of these assets to his fleet commanders for specific tactical and training missions in their areas of responsibility. The fleet commanders then subassign sets of these frequencies to type commanders for training missions and to task forces, task groups, and individual units for training and operational missions. These subassignments require coordination to ensure that any fixed-site shore stations coordination to ensure that any fixed-site shore stations in the area of responsibility are not interfered with and that the concurrent deployment of adjacent task forces or task groups does not cause mutual interference. Some of the subassignments are restricted to at least 322 to 644 kilometers (200-400 miles) away from specific land mass boundaries.

d. With a specific set of assigned frequencies, the commanding officer or officer in tactical command (OTC) of a task force, task group, or element can then plan for and use these assets in pursuit of his operational emission requirements. Emission planning is the process of orderly development of an electromagnetically compatible emission structure as a function of time to meet stated requirements. The assurance that adjacent emissions (other task groups or shore emitters) will not interfere is the basis of the subassignment. Emission use is the execution of the resulting plan and the actual deployment of the subassigned frequencies of specific mission requirements.

E102. INTERRELATIONSHIPS

Radio frequency allocation, assignment, and scheduling interrelate and are dependent on the spectrum management hierarchy. The allocation of frequency bands in the international regulatory sense may differ from the U.S. national allocations of spectrum space to meet new requirements. The U.S. national allocations do not depend upon notification to the IFRB but do depend on DoD approval based on the availability of particular bands of the spectrum as a result of an ITU allocation to a particular radio service; for example, fixed, mobile, maritime mobile, radiolocation, or satellite. Major systems are reviewed and evaluated by the Spectrum Planning Subcommittee of the IRAC and approved by NTIA at the national level. DoD telecommunication equipment must be approved for operation in accordance with constraints imposed by the MCEB. Interrelationships of spectrum management functions are summarized as follows:

a. International bands allocated to particular radio service (e.g., fixed, mobile, maritime mobile, radiolocation, satellite) must exist before the equipment concept phase.

b. National frequency allocation approval must be obtained before development/procurement of C-E equipment.

c. Frequencies are aligned before they are subassigned and scheduled for usage.

d. Frequencies are coordinated and authorized before they are subassigned and scheduled for usage.

e. Frequencies are subassigned and scheduled for usage in the development of communications plans.

f. Frequencies are scheduled and used in the implementation of communications plans.

E103. SPECTRUM MANAGEMENT HIERARCHY

The explanation in the next several paragraphs briefly traces spectrum management from the ITU to the individual unit, describing the procedures involved at the various levels. No attempt is made to document national and international procedures in detail, since the emphasis of this manual is on naval spectrum management.

E104. INTERNATIONAL LEVEL

By international agreement, the body charged with maintaining order in the electromagnetic spectrum is the ITU and its committees--the IFRB and the International Radio Consultative Committee (CCIR). The IFRB correlates allocations and assignments and maintains a list of the world. The International Telegraph and Telephone Consultative Committee (CCITT) and CCIR study technical and operational questions and issue recommendations that provide the basis for the international regulations.

E105. NATIONAL LEVEL

The United States is represented in the day-to-day business of the ITU for Federal spectrum use by the NTIA, formerly the OTP. NTIA is a division of the Department of Commerce. The IRAC, which supports the NTIA, is a joint committee of all executive level departments and agencies of the Government that gathers to develop U.S. policy with respect to the radio frequency spectrum. The Army, Navy, and Air Force are represented on the IRAC.

E106. DoD/DON LEVEL

The use of the spectrum within the DoD is governed by the MCEB through the FP. The FP implements the international and national policies for DoD spectrum use and formulates DoD positions. Representatives of the military services and DoD agencies are members of the FP. CNO, NAVEMSCEN, and Marine Corps personnel represent DON at the MCEB and FP. The FP has both standing and ad hoc working groups to resolve DoD policy, planning allocations, assignment, and notification issues.

E107. OPERATIONAL LEVEL

In actual practice, two of the FLTCINCs (CINCPACFLT, CINCLANTFLT) have removed themselves from the day-to-day spectrum management process. Spectrum management is accomplished with delegated authority from these two CINCS and the appropriate Unified Commander.

a. In the Pacific, spectrum management is under the control of the Unified Commander's (USCINCPAC) spectrum management office (JFMO PAC CAMP SMITH HI). CINCPACFLT does not play an active role at all. Actual day-to-day Navy frequency management is aligned with the numbered fleets. In the Eastern Pacific, actual management of the spectrum is accomplished by NCTAMS EASTPAC and COMTHIRDFLT, while in the Western Pacific, it is by NCTAMS WESTPAC and COMSEVENTHFLT. It is these two NCTAMS who administer the Navy's portion of the frequency pool described in paragraph 1.b. of Annex E for the FLTCINC. The numbered fleet commanders (COMTHIRDFLT and COMSEVENTHFLT) publish OPORDS (paragraph 9 of Annex E) for day-to-day operations within their area of responsibility.

b. In the Atlantic, the spectrum manager for the Unified Commander and the FLTCINC is combined into one officer - JFMO LANT NORFOLK VA. With authority from USCINCLANT and CINCLANTFLT, JFMO LANT handles the day-to-day frequency requests from fleet units and commands in the Atlantic Commuications Area. Authority for management of the Atlantic Fleet ship/shore frequency pool is delegated to NCTAMS LANT NORFOLK VA. Both CINCLANTFLT and COMSECONDFLT have published OPORDS for daily operations as well as contingencies.

c. The Mediterranean is the only area where the FLTCINC actually plays a role in spectrum management for his area. CINCUSNAVEUR performs ongoing liaison with the Unified Commander, USCINCEUR, in host government coordination and other policy matters. NCTAMS MED NAPLES IT administers the frequency pool
and the COMSIXTHFLT OPORD contains the day-to-day communications procedures and frequency plan for units in the Mediterranean.

E108. <u>ASHORE COMMUNICATIONS SUPPORT</u>

a. In support of the transfer of required information to/from underway task forces, the Naval Telecommunication System or NTS, has been put in place. This system is described in detail in NWP 4, Basic Operational Communications Doctrine. The system is aligned with the four numbered fleets, each numbered fleet having one Naval Computer and Telecommunication Area Master Station (NCTAMS) and a number of Naval Computer and Telecommunication Stations (NAVCOMTELSTAs) in support.

FLEET	NCTAMS
SECOND	LANT NORFOLK VA
THIRD	EASTPAC HONOLULU HI
SIXTH	MED NAPLES IT
SEVENTH	WESTPAC GQ

b. For traffic that must be moved from shore to the many ships and units at sea, within each NAVCOMMAREA a different multichannel fleet broadcast is used. Which channel(s) of this broadcast a ship copied is/are determined by ship type and/or mission. Messages enter the broadcast at the Broadcast Control Station (BCS), usually the NCTAMS, who assembles the messages into separate keystreams for each channel. From the BCS, the traffic moves on to the various NAVCOMTELSTAs in the COMMAREA. These NAVCOMTELSTAs, acting as Broadcast Keying Stations (BKS), simulataneously transmit the broadcast over a variety of the HF frequencies and satellite links. The actual method used by the ship depends on location and other operational considerations. No acknowledgement is required for messages received via this method. Each ship is responsible for screening the appropriate channels for their messages and maintaining broadcast number continuity.

c. The transmission of messages from underway units to the shore communications establishment for further relay via the Defense Information System (DIS) is accomplished by the use of the Common User Digital Information Exchange (CUDIX) nets via dedicated satellite channels or by the use of HF on-call ship/shore circuitry at NAVCOMTELSTAs. Use of CUDIX requires a message request to the area NCTAMS for satellite access. For HF ship/shore nets however, all that is required is to be aware of the frequencies used by the desired NAVCOMTELSTA and enter one of the nets as required. The majority of these nets are full duplex and on the air 24 hours a day.

d. Certain ships and afloat commands transmit and receive large quantities of message traffic daily. These include aircraft carriers, fleet flagships and others. If this traffic were allowed to be transmitted via the multichannel broadcast, its volume would backlog the system to such an extent as to render it useless. An alternate method, the full period ship/shore termination, is used to prevent this. This termination may be either HF or satellite link and is always full duplex. It is used to pass all messages specifically addressed to these units from ashore and as a means for the ship to transmit its messages ashore. The NAVCOMTELSTA then enters these messages into the DIS for onward delivery to ultimate destinations worldwide. If HF, this termination may be either single channel (1K24F1B) or multichannel (3K00J7B/6K00B9W) teletype, depending on the traffic load and shipboard capability.

e. Frequencies for these fixed-station, land-based operations (broadcast, shore termination frequencies) are assigned by the FP through the Unified Commander and FLTCINC to the appropriate transmitter location. Frequencies for use by fleet units are obtained from the Navy frequency pool authorized by the Unified Commander. All these frequencies are published and updated quarterly by the regional NCTAMS in a set of messages called Communication Information Bulletins (CIBs). All ships are required to maintain a file on the effective CIBs for their NAVCOMMAREA.

E109. DEMANDS ON SPECTRUM USE

a. Initially, the fleet's use of the electromagnetic spectrum was devoted to communications between afloat users and between afloat users and the shore establishment. As the individual missions of ships, task forces, and other echelons of command have become more complicated, the resulting use of the communications portion of the spectrum has likewise become more intense. In addition to the use of the spectrum for communications, the following have been added to the fleet's use of the spectrum: navigation of ships and aircraft, the radar detection of other vessels and planes, the radar control of guns and guided missiles, and the attempt either to deny use of the spectrum or to stop an enemy from denying use of the spectrum via EW systems. To accommodate all of this spectrum use, the functions and chain of command described were instituted. The discipline imparted to spectrum use by this chain of command results in the following set of demands that affect spectrum use:

(1) Must meet mission performance parameters.

(2) Must be guided by national and international agreements.

(3) Must not cause harmful interference to friendly area outside of the task force.

(4) Must not cause harmful interference with other emitters on the same platform.

(5) Must consider potential EMI from friendly and unfriendly areas outside of the task force.

(6) Cannot exceed the equipment capabilities aboard the mission platforms.

b. Satisfaction of these demands on the spectrum is accomplished by the execution of various functions at differing levels of the described structure. Meeting the mission within the specified performance parameters is accomplished by ensuring that the frequencies in use are the subject of a valid assignment and in turn that the equipment has been the subject of a valid allocation before development and installation. International agreements and treaties are satisfied by the registration process. National agreements between services and other Governmental and nongovernmental agencies are satisfied by the assignment process, assuming that each assignment, in turn, has a valid allocation. Interference to non-task force emitters is accounted for at the FLTCINC level in the process of subassignment of frequencies for use. Mutual interference within the task force is accounted for during the planning and use phases of the frequency by the task force staff.

c. The satisfaction of these demands has led to the development of the chain of command or hierarchy. Each level of the hierarchy, in turn, has developed procedures for handling its required functions in support of the mission of the overall system in meeting these demands in each FLTCINC are. The processes are generally manual and time consuming.

E110. OPERATIONAL METHODOLOGIES

E111. GENERAL

a. To achieve the orderly execution of the functions by the hierarchy while complying with the demands, the Navy uses a set of operational procedures that vary with emission category (communications, radar, and electronic warfare). These procedures, in turn, are subjected to stress as crises occur. The procedures vary with respect to the particular process being performed by a given staff element (requirement management, spectrum management, emission planning management, and emission equipment management).

b. A complete description of the processes used operationally requires an analysis of a cross section of the overall spectrum management problem, including emitter type, characteristics, defense condition, procedural areas, and timeliness requirements. Within this section, the overall description of the processes for each emission type is first presented. A brief description is then given of the net effect upon these overall methods as the defense condition changes. These categorizations of the spectrum management methodologies are summarized as follows:

(1) Emission Category

Communications
Radar
EW

(2) Defense Conditions

Peacetime
Contingency
Wartime

(3) Procedural Categories

Requirement management
Spectrum management
Emission planning
Equipment planning
Platform deployment

E112. PROCESSES BY EMISSION CATEGORY

The methods and procedures of spectrum management, discussed here in terms of current methodology and including any simplifying manual processes used by the operating fleet, can be referred to when the requirements for automation are described in latter sections. Overall parameters of the problem, by emission category, are as follows:

a. Communications Estimates

70,000+ assigned frequencies (200,000 users)
(25,000+ at CINCLANT, 25,000+ at CINCPAC)

7+ pertinent satellites (100+ individual channels)
10,000+ shore-based equipments

24,000+ ship/airborne-based equipments

b. Radar Emitters (beacons)

10,000+ shipborne/airborne emitters

600+ type of equipment

11 bands (UHF up)

c. Electronic Warfare

500+ equipment

150+ types of equipment

All bands (UHF up)

E113. COMMUNICATIONS EMITTERS

a. Fleet communications can be viewed as having two components: the communications necessary for the various elements of the task force to correspond with each other in support of their collective mission and the communications necessary to support correspondence with ashore activities. The two sets of communications are processed for spectrum use in different ways. Intra-task-force communications, because all the elements are approximate, usually involve either UHF or ground wave HF transmissions depending upon the force geometry. The nets required, both as functions of mission and of force geometry, are usually predetermined in the communications annex to the applicable OPORDER. Generally, they remain fixed because the communications are not affected by propagation anomalies. The ship/shore/ship connectivity, however, is usually by satellite or HF sky wave. If subassignments for these nets will change as a function of time as coordinated with the terminating shore station, the accomplishment of successful intra-task force communications is presently fraught with several problems. By the nature of the development process, an OPORDER must first be generated by personnel responsible for determining the events to be performed. Therefore, the communicator is in the second echelon of the planning cycle. In the first echelon, actual planning of exercise or operational events can be an iterative process that can significantly reduce the amount of time available for communications planning. If the operation is large, this can result in insufficient communications planning.

b. A communications plan is sensitive to the requirements of the particular afloat community for which the plan is developed. The specific ships within a task force and the specific mission for which the ships are deploying will dictate a unique communications doctrine for given exercise/operation. Therefore, the basic guidance of Naval Warfare Publication 4 (NWP 4), BASIC OPERATIONAL COMMUNICATION DOCTRINE, must be augmented by the subtleties of the particular force. The corporate memory required for the development of the subtleties is invested in communications planning personnel afloat. Optimal planning of communication requirements for any exercise must be accomplished by afloat personnel to ensure that all of the particular requirements are met.

These planning staffs, however, are generally small and usually must be augmented in today's environment by other communications personnel, who are thus detracted from their normal duties.

c. As the OPORDER nears completion, the communications planners begin to complete a profile of the communications nets to be used. At some date before deployment, a judgement is made that the communications circuit construction or profile is complete enough for analysis of frequency availability to meet the requirements of circuits. Invariably, this results in the realization that the frequencies currently on hand are insufficient to satisfy the requirements levied, resulting in a request for scheduling the use of more frequencies from some higher authority. The process of constructing the communications profile is stopped momentarily while a count of the required frequencies is made and an appropriate message requesting the additional frequencies is generated. Three principal deficiencies result. The frequencies made available to the operation are removed from use by a large portion of the NTS for the duration of the exercise, even though they may be used for only a short time during the exercise. Delay is encountered in determining the frequency set required and additional inflexibility is imposed on the planning process owing to the long time required by the scheduler ashore to meet the requirements of this request and the undesirability of changing the request after the submission.

d. Upon receipt of the set of exercise/operation frequencies, the same staff that generated the communications profile must assign the frequencies to specific nets. This process is performed by comparing the available frequency assets (those normally scheduled to the particular command and those scheduled from higher authority) against the written communications profile. It is usually assumed that the first and second demands on the use of the spectrum are met as a result of scheduling. However, individual judgment is used in the determination of whether or not a given set of frequencies will meet the third and fourth demands on the use of the spectrum. Experience with the frequencies available tells the communicator whether a reasonable set exists. This experience, however, varies widely in the fleet, and lack of experience causes development of poorly engineered communications plans.

e. The development of the communications profile and plan is also limited by the inability of communications personnel to analyze the current configuration and status of the individual ship's equipment so as to meet the particular needs of each segment of the communications plan, the last constraint. This results, from time to time, in requiring ships to terminate more nets than their communications equipment can support, and can ultimately result in a panic change to the proposed communications plan at the last minute, when an individual communicator determines that he is oversubscribed.

f. In the last days before deployment, as the individual ships ready their equipment and run appropriate test, casualty reports (CASREPs) begin to appear on equipment that does not meet the minimum specifications required for communications. Depending on the gravity of the loss of the particular equipment, a wholesale change to the postulated plan may have to be determined rapidly. It is common practice, therefore, for communicators afloat to attempt solutions to these problems outside the communications plan. The result, on occasion, is catastrophic communications failure. The fundamental problem, however, is that by doing the communications plan manually, the planner is not capable of coping in a timely manner with short-fused modifications to the plan. There is simply insufficient time in which to properly effect the change.

g. During deployment, the missions of components, task groups, and individual ships will change with the operational situation. These contingencies usually will be accounted for in the communications plan; however, emergency situations, such as a lost plan, may require unplanned breakoff of components of the exercise or operation to fulfill additional duty--another chaos-producing panic change. These detachments will also periodically effect changes to net control and guard assignment, producing further confusion as the task force is reconfigured.

h. Within the deployed task force, the intra-task-force communications plan is set in place to permit internal communications. Superimposed upon this use of the spectrum is the requirement for units of the task force to communicate with shore activities for command and control, logistics, and other matters. This is accomplished by ship/shore termination with one of the NAVCOMTELSTAs distributed around the globe. Depending upon the ships' communication equipment sites and the commands embarked, this may be either a full-period or temporary use of the shared primary ship/shore/frequency. If ship/shore communications are via satellite, the portion of the spectrum used is allocated for satellite transmission and hence is free from interference. The use of HF skywave, however, implies a discrete frequency in the HF band, which is assigned for ship/shore use. These high frequencies are interleaved in the HF band with the other high frequencies, meaning that the use of these frequencies is susceptible to interference with and to the intra-task-force frequencies. Further, owing to the vagaries of propagation, the ability to communicate within a given area of the HF range will change as a function of time. Not only does this changing HF apportionment require a good deal of labor on the part of both the afloat and ashore communicator, but the changing interference situation can cause havoc in both intra-task-force and ship/shore communications.

E114. RADAR EMITTERS AND RECEIVERS

a. The scheduling and use of frequencies for radar emitters and receivers are subject to many of the same constraints as are communications emitters and receivers. For surface combatants, the requirement for the simultaneous operation of radars designed for navigation, air search and track, surface search and track, and gun and missile fire control is unquestioned. Similar requirements exist for noncombatants. If these radars are to operate collectively at maximum performance, a comprehensive frequency management program is mandatory to at least minimize the adverse effects of interference due to spectrum crowding. Without judicious frequency management, the effects of interference could completely negate the desired activity of some of these radars, with catastrophic results. For example, a missile or gun weapon system could fail to engage a designated target, or if the same Continuous Wave Illumination (CWI) channel is used on two different ships, a missile could home on the CWI energy radiating from a friendly ship.

b. NAVSEA T9407-AA-GYD-010/CS OP-3840, Electromagnetic Compatibility Criteria for Surface Weapons Systems, currently is the principal tool for ensuring proper frequency management among specific radars and combat systems. This is a three-volume publication, supported by fleet operational software, that provides the operational commander with the background, guidance, and automated procedure to maximize EMC among radar components of the TERRIER, TARTAR, Basic Point Defense, and NATO SEA SPARROW surface missile systems.

c. Additional efforts are under way to develop a similar capability for other radars and combat systems operating in the 8 to 15 GHz portion of the and the electromagnetic spectrum. These include the LN-66, AN/SPS-55, AN/SPN-35, AN/SPN-35A, Raytheon Pathfinder series of navigation radars. Criteria has been developed for the MK 68, MK 86, MK 92, and MK 94 Gun Fire Control Systems (GFCS).

d. The NAVSEA EMC criteria and its attendant computer software, the Electromagnetic Compatibility Analysis Program (EMCAP), have many desirable features that could be incorporated into the Spectrum Use Management System (SUMS) architecture. These features include ease of operation by Fleet personnel, reasonable flexibility, timeliness, uniform doctrine, specific tools, and applicability to all mission areas within its defined scope. Currently, the EMC criteria is not all inclusive. The follow-on efforts will substantially increase the Navy's capability to quickly and easily coordinate the frequency assignments for radar systems; however, coordination with communication and the EW systems is not within the scope of the EMC criteria or the Combat System Frequency Management Program (CSFMP).

E115. ELECTRONIC WARFARE EMITTERS

a. The operation of EW emitters can significantly affect on-board communications and radar emitters when provisions are not made for antenna separation and isolation. Since Electronic Countermeasures (ECM) equipment has the capability to respond automatically to threatening and friendly emitters, its use must be governed by ship engagement policy and weapons direction. Frequency assignment and time-sharing are necessary considerations. Onboard blanking is essential for electronic support measures (ESM) operation , and guard zones per ship must be established. The heavier the threat environment, the more critical the interference situation becomes, since the need for both fire control emission and ECM emission becomes greater.

b. The lack of a composite emitter data base that includes all radar and other electronic equipment aboard a task force presents to the EW community the problem of making decisions without composite own-force data. Since these decisions in the afloat environment must be made with incomplete information and without any automated algorithms, the resulting analysis is limited in effectiveness. In particular, the decision to use a given piece of EW equipment without knowledge of the precise environment in the task force could lead to catastrophic interference either within the communications segment of the task force or within the radar umbrella of the task force. This could result either in a requirement for limited withdrawal of radar or communications coverage or in decrease in the effectiveness of the EW being employed.

E116. PROCESSES BY OVERALL DEFENSE CONDITION

In the last section, spectrum management was described as it relates to different categories or emission equipment. In this section, the state of these processes in routine peacetime operations is described. From this baseline, the changes brought about by contingency and wartime situations are then described. The actions applicable for each of the defense conditions are as follows:

a. Peacetime

Normal deployment and transit
Exercises (OPORDERS)
Static emission umbrella

b. Contingency and Wartime Situations

Fast augmentation - size depends on situation.
Dynamic emission umbrella.
Emission umbrella complicated at point of crisis by local emitters.

E117. <u>ROUTINE PEACETIME</u>

a. Within the context of normal peacetime operations, several levels of emission operations evolve. These are keyed to the normal deployment of forces in support of peacetime national missions and to the deployment of forces in exercise scenarios for training. Within these situations, the total set of rules and regulations governing frequency use within the various areas would be in force, and all requisite checks on the availability and use of individual frequencies would be used. The deployment of equipment using the frequency spectrum should be subject to lengthy and detailed compatibility engineering and frequency clearance procedures that in some cases would not allow a given equipment to be deployed to meet a specific operational requirement.

b. Within the peacetime scenario, the following system objectives apply:

(1) Identify the current force distribution within the area of responsibility and the emission requirements in force in support of this distribution.

(2) Identify equipment distribution and connectivity currently supporting the force distribution noted above.

(3) Identify the emission environment currently in support of the force distribution and the emission environment surrounding this force distribution,

which is in place because of emitters other than U.S. military.

(4) Optimally assign frequencies to given requirements, accounting for local emission problems, propagation, the area involved and other equipment engineering, or germane EMC considerations.

(5) Implement these capabilities in a way that allows responsive update to the total environmental picture as equipment fails, environmental conditions change, requirements change, or change occurs in external influences, such as an emission parameter that is modified by another government.

c. These objectives are stated to meet the normal day-to-day responsibilities of the frequency coordinators and users within the joint arena and as such will require composite identification of all parameters for all conditions and for all services. Frequency assets earmarked with specific use restrictions would be used in other ways if the assignment of the frequency allows it. Further, the generation of emission plans for exercises within this environment would be treated as a contingency change to peacetime requirements for a limited time and would receive a schedule of frequencies for use based upon the total number available, while accounting for all the objectives discussed above.

E118. <u>CONTINGENCY AND WARTIME SITUATION MANAGEMENT</u>

a. With the capability outlined in paragraph 17. for peacetime operations, the extension of the requirement to include crises of varying scopes becomes a matter of adjusting the emission environment to meet the new requirements. This would require the phased adjustment of the overall emission environment to meet the change in position of the force to meet the crisis, the changing emission environment caused by evoking contingency emission plans and Communications-Electronics Operating Instructions (CEOIs), changes in the emission environment caused by external environmental changes, and changes to the overall engineering conditions (propagation, radio frequency interference (RFI), scintillation, etc.) in the area occupied in reaction to the crisis. While this would amount to labor-intensive period on the part of the personnel working the emission management problem, the transition from peacetime to crisis would be an orderly set of adjustments.

b. Using the capabilities stated in paragraph 17., scenarios depicting the contingencies that could evolve into crisis situations can be simulated, and appropriate contingency emission plans can be developed. The scenarios, one or several at a time, can indicate the flaws that would exist in the transition from various peacetime scenarios to differing crises. Judgments can then be made on the equipment and spectrum to be used during each transition. As actual operations in a crisis are pursued, differences with the simulated scenarios could be noted, and appropriate changes in communications/electronics could be developed to meet the changing environment.

E119. TIMELINESS REQUIREMENTS OF SPECTRUM MANAGEMENT

Current methods of frequency management for the Fleet have built-in time constraints. A timeliness factor that would satisfy force commander's total frequency requirements is not definable because current operations for frequency management for communications, radar, EW, and other uses are disjointed. A task force commander (including a task group or element commander, such as an OTC) has a variety of frequency needs with timeliness factors ranging from a few seconds to many hours. Complex interactive and individual planning is necessary to reasonably satisfy the total spectrum requirements. Such planning by individual elements of command and across command structures is not consistent with an optimum compatibility requirement of spectrum management. A spectrum use management system implies the harmonious and timely satisfaction of all the functional frequency requirements of a task force commander. The optimum spectrum use management system requires that automation and compatibility techniques be employed to the extent possible to satisfy fleet spectrum needs.

ANNEX F

FREQUENCY PROTECTION AND INTERFERENCE

F101. GENERAL

A primary concern of spectrum management is that the frequency resources allocated for a particular use will either not be used or will be misused, thus depriving some other candidate of the benefits of that portion of the spectrum. In addition, new or expanding uses for the spectrum will of necessity upset the status quo of established allocations and assignments. Therefore, the spectrum manager is concerned with existing allocations and assignments as well as with the use or abuse of the spectrum. The frequency manager has available a number of tools to assist him in his day-to-day activities in performance of this task. The primary and most useful tool is the computer. New and increasingly complex and sophisticated programs are being developed to ensure timely and accurate recording of the spectrum management information.

F102. ENCROACHMENT TO MILITARY COMMUNICATIONS - ELECTRONIC (C-E) INSTALLATIONS

F103. BACKGROUND

The proliferation of C-E equipment has resulted in increased potential for radio frequency EMI situations. This increasing electronic density can result in degradation of Navy and Marine Corps C-E equipment and reduced flexibility of operation.

a. Investigations of cases in which other agencies have proposed installations near naval activities have indicated that the potential radio frequency interference to or from the proposed installation would seriously degrade or restrict naval operations. In certain instances, extensive and expensive on-site measurements and coordination at the national level have been necessary to protect the sites concerned. It is important, therefore, that potential EMI situations be brought to light as soon as possible.

b. The NAVEMSCEN, for the CNO, reviews AM, FM, and TV broadcast station applications submitted to the FCC for possible impact upon USN and USMC facilities. However, this review is not all inclusive, and field activities or offices often are aware of a proposed C-E installation near a USN or USMC facility before the CNO is informed through the FCC.

F104. REPORT REQUIRED

Commands cognizant of a potential situation due to a proposed nonmilitary C-E equipment installation or a change (such as a power increase) to an existing installation should forward the technical details to the Chief of Naval Operations (OP-940T) for investigation, as appropriate.

F105. REQUESTS FOR REPORTS ON USN AND USMC USE OF THE ELECTROMAGNETIC SPECTRUM

a. Many organizations, both military and nonmilitary, are engaged in independent studies of EMC problems. These organizations desire environmental information as well as other data pertaining to the electromagnetic spectrum.

b. Any activity outside the DON seeking cumulative data on naval use of the electromagnetic spectrum, including environmental and spectrum signature data in the ECAC files, shall be requested to refer the matter to the CNO (OP-940T).

F106. HARMFUL INTERFERENCE

a. In the Navy, the term harmful interference denotes any emission, radiation, or induction that endangers the functioning of a radio-navigation service or other safety service, or which seriously degrades, obstructs, or repeatedly interrupts a radio communication service operating in accordance with established regulations.

b. Harmful interference can be induced intentionally, as in some forms of electronic warfare, or unintentionally, from spurious or harmonic emissions, intermodulation products and the like. It also results from cochannel or adjacent channel assignments.

F107. INTERFERENCE REPORTS

a. Any occurrence of data transfer interruption that is suspected to have been caused by foreign electronic warfare (EW) action will be reported in accordance with OPNAVINST 3430.18 series as a MIJI (Meaconing, Intrusion, Jamming, and Interference) incident.

b. If interference is thought to be unintentional and due to interaction with other electronic systems operating in the same general environment, it should be reported using the appropriate format below.

c. If interference is due to another (known) station occupying the same or adjacent frequency band or channel and the problem cannot be resolved locally, it should be reported in accordance with Chapter 6, ACP 190. If there is not sufficient information to enable tracer action by higher authority, a MIJI report should be submitted in accordance with OPNAVINST C3430.18 series, including the Fleet Commander or Naval Area Frequency Coordinator, CNO, and NAVEMSCEN as information addressees.

d. Unless there are unusual circumstances, reports should normally not be submitted when:

(1) The harmful interference has ceased before it can be reported by message, except when it is of recurring nature, or

(2) Annoying interference is experienced, since some interference is to be expected from stations sharing the same or adjacent channels.

F108. <u>INTERFERENCE TO COMMUNICATIONS</u>

a. Interference to communications, other than a bona fide MIJI incident, should be reported to the cognizant area frequency manager in the following format. Use ROUTINE precedence unless the incident is believed to be hazardous to air navigation or flight safety.

(1) Call sign or other identification. (If station can be identified, the possibility of eliminating the interference is greatly increased.)

(2) Measured frequency.

(3) Type of emission and type of traffic being transmitted.

(4) Measured bandwidth of interfering signal. (Provide lowest and highest frequencies; indicate the type of equipment used for measurement.)

(5) Signal strength. (If field strength meter not available, use scale 1 to 5.)

(6) Nature or severity of interference. Indicate severity as percentage of copy, or intelligence lost through interference.

b. Transmitter station being interfered with:

(1) Call sign or name of station

(2) Assigned frequency.

(3) Measured frequency.

(4) Type of emission and type of traffic or signals being transmitted.

(5) Measured bandwidth.

(6) Signal strength.

c. Receiving station experiencing interference:

(1) Call sign or name of station.

(2) Location: Quote coordinates of station in degrees of latitude and longitude. In the case of a

fixed station, indicate the nearest major city and state or country.

(3) Date and time that interference commenced and duration in minutes.

(4) Other particulars.

(5) Requested action.

NOTE: An X after any of the above letters indicates that no information on this particular item is reported.

F109. EMC: HARMFUL INTERFERENCE REPORT

Interference of this nature should be reported in the following format, using control symbol OPNAV Report 2410.1:

a. Equipment(s) affected by the interference.

b. Allocated frequency band or assignment of affected equipment.

c. Equipment causing interference and location, if known.

d. Allocated frequency band assignment of interfering equipment.

e. Probable cause of interference (i.e., harmonic, intermodulation, spurious products, etc.)

f. Extent of impairment to operational capability of affected equipment.

g. Corrective measures taken to combat interference.

h. Effect of corrective measures.

i. Any additional remarks considered useful.

F110. <u>RADIO FREQUENCY INTERFERENCE DATA SHEET ON PROPOSED INSTALLATION</u>

Potential electromagnetic encroachment on a military telecommunication installation by a nonmilitary activity should be reported under report control symbol OPNAV Report 10550.1, as shown on the next page.

OPNAV Report 10550.1

I. POTENTIAL INTERFERING SOURCE *

Name (Nonmilitary agency involved)______________________________________

Location (Latitude and Longitude) ____________

Equipment Nomenclature (If available)_________
(at transmitter location?)

Power (Peak)___ (at receiver location)_________

Frequency Range______________________________

Antenna Description:
Type ____________________________________
Height _Above Ground: Size: _________
Gain ____________________________________

II. VICTIM

Equipment Nomenclature _______________________
Location (latitude and longitude) _______
Predicted Extent/Effects of Interference/Degradation _________________
____
____

III. AMPLIFYING INFORMATION (as necessary to the understanding of the problem):

____
____

* Where exact parameters are not known, provide estimates.

ANNEX G

SPECIAL CODES

G101. GENERAL

Frequency allocation and assignment requires the completion and submission of application DD Form 1494 and the frequency assignment proposal message, respectively. The instructions for completing these forms are included in previous annexes. This annex provides a reference of codes for use in completing the forms. The paragraphs below include the following codes:

a. Station classes - an alphabet code used to define the configuration of various electronic devices that use the electromagnetic spectrum.

b. Electromagnetic emission designators - a system defining the classes of electronic radiations from transmitters according to bandwidth type of modulation, nature of modulating signal, and type of information to be transmitted.

c. Geographic codes - a standard abbreviated name for a geographic location.

G102. STATION CLASSES

This section provides station class definitions for use where required to complete the frequency assignment proposal message. The stations are listed in alphabetical order. A letter "A","S", "L", or "M" must be suffixed to the station symbol to specify the type of earth station. "A" is for stations aboard aircraft, "S" is for stations aboard ship, "L" is for stations aboard land vehicles, and "M" is for stations on two or three of the foregoing.

Definition (Symbol)

Aeronautical Broadcast Station (FAB)
Aeronautical Fixed Station (AX)
Aeronautical Marker Beacon Station (RLA)
Aeronautical Mobile-Satellite Aircraft Earth Station (TJ)
Aeronautical Mobile-Satellite Earth (TB)

<u>Definition</u> (Symbol) (Contd.)

Aeronautical Mobile-Satellite Space Station (EJ)
Aeronautical Radiobeacon Station (RLB)
Aeronautical Radionavigation-Satellite Earth Station (TZ)
Aeronatuical Radionavigation-Satellite Mobile Earth Station (TO)
Aeronautical Radionavigation-Satellite Space Station (EO)
Aeronautical Station (R) - (FD)
Aeronautical Station - (FA)
Aeronautical Station (OR) - (FG)
Aeronautical Telemetering Land Station (FLEA)
Aeronautical Telemetering Mobile Station (MOEA)
Aeronautical Utility Land Station (FLU)
Aeronautical Utility Mobile Station (MOU)
Aircraft Station (MA)
Airdrome Control Station (FAC)
Altimeter Station (ROA)
Base Station (FB)
Broadcasting-Satellite Space Station (sound broadcasting) - (EB)
Broadcasting-Satellite Space Station (television) - (EV)
Broadcasting Station, Sound (BC)
Broadcasting Station, Television (BT)
Coast Station (FC)
Earth Exploration-Satellite Earth Station (TW)
Earth Exploration-Satellite Space Station (EW)
Earth Station (receiving) (TP)
Experimental Composite Station (XM)
Experimental Contract Developmental Station (XC)
Experimental Developmental Station (XD)
Experimental Export Station (XE)
Experimental Research Station (XR)
Experimental Station (EX)
Experimental Testing Station (XT)
Fixed-Satellite Earth Station (TC)
Fixed-Satellite Space Station (EC)
Fixed Station (FX)
Flight Telemetering Land Station (FLEB)
Flight Telemetering Mobile Station (MOEB)
Flight Test Station (FAT)
Glide Path (Slope) Station (RLG)
Hydrologic and Meteorological Mobile Station (MOH)
Hydrologic and Meteorological Fixed Station (FXH)
Hydrologic and Meteorological Land Station (FLH)
Inter-Satellite Space Station (ES)
Land Earth Station (VA)

<u>Definition</u> (Symbol) (Contd.)

Land Mobile Station (ML)
Land Mobile-Satellite Space Station (EU)
Land Station (FL)
Land-Mobile Satellite Earth Station (TY)
Localizer Station (RLL)
Loran Station (RLN)
Marine Broadcast Station (FCB)
Marine Radiobeacon Station (RLM)
Maritime Mobile-Satellite Coast Earth Station (TI)
Maritime Mobile-Satellite Ship Earth Station (TG)
Maritime Mobile-Satellite Space Station (EG)
Maritime Radionavigation-Satellite Earth Station (TX)
Maritime Radionavigation-Satellite Mobile Earth Station (TQ)
Maritime Radionavigation-Satellite Space Station (EQ)
Meteorological Radar Station (WXD)
Meteorological-Satellite Earth Station (TM)
Meteorological-Satellite Space Station (EM)
Mobile Station (MO)
Mobile-Satellite Service Mobile Earth Station (UA)
Mobile-Satellite Space Station (EI)
Oceanographic Data Station (OD)
Oceanographic Data Interrogating Station (OE)
Omnidirectional Range Station (RLO)
Portable Aircraft Station (MAP)
Portable Land Mobile Station (MLP)
Portable Mobile Station (MOP)
Portable Radiolocation Station (MRP)
Portable Ship Station (MSP)
Radar Beacon (racon) Station (RLC)
Radar Beacon Precipitation Gage Station (WXB)
Radio Astronomy Station (RA)
Radio Beacon Mobile Station (MOB)
Radio Range Station (RLR)
Radio-Direction-Finding Station (RG)
Radiolocation Land Station (LR)
Radiolocation Mobile Station (MR)
Radionavigation Land Station (RL)
Radionavigation Land Test Station (Maintenance Test Facility) (RLTM)
Radionavigation Land Test Station (Operational Test Facility) (RLTO)
Radionavigation Mobile Station (NR)
Radionavigation-Satellite Fixed Earth Station (TN)
Radionavigation-Satellite Mobile Earth Station (U)
Radionavigation-Satellite Space Station (E)

Definition (Symbol) (Contd.)

Radiosonde Station (WAR)
Radiosonde Ground Station (WXRG)
Satellite EPIRB Station (TE)
Ship Station (MS)
Sounder Network Station (SN)
Sounder Prediction Station (SP)
Space Operation Earth Station (TT)
Space Research Earth Station (TH)
Space Research Space Station (EH)
Space Telecommand Earth Station (TD)
Space Telecommand Earth Station (Fixed-Satellite Service) (TCTD)
Space Station (ME)
Space Operation Space Station (ET)
Space Telemetering Earth Station (TR)
Space Telemetering Space Station (ER)
Space Tracking Transmitting Earth Station (Emergency Position-Indicating Radio Beacon (EPIRB) (TETK)
Space Telemetering Transmitting Earth Station for (EPIRB) (TETR)
Space Tracking Earth Station (TK)
Space Tracking Space Station (EK)
Space Telecommand Space Station (ED)
Standard Frequency and Time Signal-Satellite Space Station (EE)
Standard Frequency and Time Signal Stations (SS)
Surface Telemetering Land Station (FLEC)
Surface Telemetering Mobile Station (MOEC)
Surveillance Radar Station (RLS)
Telecommand Aeronatuical Station - (FAD)
Telecommand Aircraft Station - (MAD)
Telecommand Base Station - (FBD)
Telecommand Coast Station - (FCD)
Telecommand Fixed Station (FXD)
Telecommand Land Station (FLD)
Telecommand Land Mobile Station - (MLD)
Telecommand Mobile Station (MOD)
Telecommand Ship Station - (MSD)
Telemetering Fixed Station (FXE)
Telemetering Land Station (FLE)
Telemetering Mobile Station (MOE)

G103. TABLE OF SERVICES, STATION CLASSES, AND STATIONS

The table below can be used to determine the proper Station Class symbol to be used and the Service in which the transmitting station will operate. Frequency bands are allocated to Services based on the U.S. Government Table of Frequency Allocations.

TABLE OF SERVICES, STATION CLASSES AND STATIONS

	SERVICE	STATION CLASS	STATION
1.	Amateur	None	Amateur
2.	Broadcasting	BC	Broadcasting (Sound)
		BT	Broadcasting (Television)
3.	Broadcasting Satellite	EB	Space (Sound)
		EV	Space (Television)
4.	Earth Exploration-Satellite	EW	Space
		TW	Earth
	Meteorological-Satellite	EM	Space
		TM	Earth
5.	Fixed	FX	Fixed
		FXD	Telecommand Fixed
		FXE	Telemetering Fixed
		FXH	Hydrologic and Meteorological Fixed
	Aeronautical Fixed	AX	Aeronautical Fixed

6.	Fixed Satellite	EC	Space
		TC	Earth
		VA	Land Earth
7.	Inter-Satellite	ES	Space
8.	Meteorological Aids	WXB	Radar Beacon Precipitation Gage
		WXD	Meteorological Radar
		WAR	Radiosonde
		WXRG	Radiosonde Ground
9.	Mobile	FL	Land
		FLD	Telecommand Land
		FLE	Telemetering Land
		FLEA	Aeronautical Telemetering Land
		FLEB	Flight Tele -metering Land
		FLEC	Surface Tele-metering Land
		FLH	Hydrologic and Meteorological Land
		FLU	Aeronautical Utility Land
		MO	Mobile
		MOB	Radio Beacon Mobile
		MOD	Telecommand Mobile
		MOE	Telemetering Mobile
		MOEA	Aeronautical Telemetering Mobile
		MOEB	Flight Tele-metering Mobile
		MOEC	Surface Tele-metering Mobile

9. Mobile (Contd.)	MOH	Hydrologic and Meteorological Mobile
	MOP	Portable Mobile
	MOU	Aeronautical Utility Mobile
Aeronautical Mobile	FA	Aeronautical
	FAB	Aeronautical Broadcast
	FAC	Airdrome Control
	FAD	Telecommand Aeronautical
	FAT	Flight Test
	MA	Aircraft
	MAD	Telecommand Aircraft
	MAP	Portable Aircraft
Aeronautical Mobile (OR)	FG	Aeronautical
Aeronautical Mobile (R)	FD	Aeronautical
Aeronautical Multicom	None	Aeronautical Multicom Land
	None	Aeronautical Multicom Mobile
Land Mobile	FB	Base
	FBD	Telecommand Base
	ML	Land Mobile
	MLD	Telecommand Land Mobile
	MLP	Portable Land Mobile
Maritime Mobile	FC	Coast
	FCB	Marine Broadcast
	FCD	Telecommand Coast
	MS	Ship
	MSD	Telecommand Ship
	MSP	Portable Ship
	OD	Oceanographic Data

		OE	Oceanographic Data Interrogating
10.	Mobile-Satellite	UA	Mobile Earth
		TE	Satellite EPIRB
		EI	Space
		VA	Land Earth
	Aeronautical Mobile-Satellite	EJ	Space
		TB	Earth
		TJ	Aircraft Earth
	Land Mobile-Satellite	EU	Space
		TU	Land Mobile Earth
		TY	Base Earth
	Maritime Mobile-Satellite	EG	Space
		TG	Ship Earth
		TI	Coast Earth
11.	Radio Astronomy	RA	Radio Astronomy
12.	Radiodetermination	None	Radiodetermination
	Radiolocation	LR	Land
		MR	Mobile
		MRP	Portable
	Radionavigation	RL	Land
		RLN	Loran
		RO	Mobile
	Aeronautical Radionavigation	RLA	Marker Beacon
		RLB	Radio Beacon
		RLC	Radar Beacon (Racon)
		RLG	Glide Path (Slope)
		RLL	Localizer
		RLO	Omnidirectional Range
		RLR	Radio Range

		RLS	Surveillance Radar
	Maritime Radio-navigation	RLC	Radar Beacon (Racon)
		RLM	Marine Radio-beacon
13.	Radiodetermination-Satellite	EF	Space
		TF	Earth
		TL	Mobile Earth
	Radionavigation-Satellite	E	Space
		TN	Fixed Earth
		U	Mobile Earth
	Aeronautical Radio-navigation Satellite	EO	Space
		TO	Mobile Earth
		RZ	Earth
	Maritime Radio-navigation-Satellite	EQ	Space
		TQ	Mobile Earth
		TX	Earth
14.	Space Operation	ET	Space
		TT	Earth
15.	Space Research	EH	Space
		TH	Earth
16.	Standard Frequency Time Signal	SS	Standard Frequency and Time Signal
17.	Standard Frequency and Time Signal-Satellite	EE	Space
18.	No Specific Service	ED	Space Telecommand Space
		EK	Space Tracking Service

ER	Space Telemetering Space
SN	Sounder Network
SP	Sounder Prediction
TD	Space Telecommand Earth
TK	Space Tracking Earth
TR	Space Telemetering Earth
XC	Experimental Contract Developmental
XD	Experimental Developmental
XE	Experimental Export
XM	Experimental Composite
XR	Experimental Research
XT	Experimental Testing

G104. ELECTROMAGNETIC EMISSION DESIGNATORS

G105. GENERAL

The ITU at its World Administrative Radio Conference, 1979, adopted a revised international method of designating electromagnetic emissions. Instructions for the revised method of designating such transmissions are contained in this Annex.

G106. NECESSARY BANDWIDTH

For a given class of emission, the width of the frequency band that is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions is the necessary bandwidth.

a. The necessary bandwidth is added just before the classification symbols and is expressed by three numerals and one letter. The letter occupies the position of the decimal point and represents the unit of bandwidth. The first character should not be a zero or K, M, or G.

b. Necessary bandwidths are expressed as follows:

(1) Between .001 and 999 Hz, in Hz (letter H).

(2) Between 1.00 and 999 kHz, in kHz (letter K).

(3) Between 1.00 and 999 MHz, in MHz (letter M).

(4) Between 1.00 and 999 GHz, in GHz (letter G).

Examples:

0.002 Hz = H002	6.0 kHz = 6K00	1.25 MHz = 1M25
0.100 Hz = H100	12.5 kHz = 12K5	2.00 MHz = 2M00
25.300 Hz = 25H3	80.4 kHz = 180K	10.00 MHz =10M0
400.0 Hz = 400H	180.5 kHz = 181K	202.00 MHz=202M
2.4 kHz = 2K40	180.7 kHz = 181K	5.65 GHz = 5G65

G107. CLASSIFICATION

Emissions shall be classified and symbolized according to their basic characteristics. Optional characteristics may be used. Normally, only the basic characteristics are required.

G108. BASIC CHARACTERISTICS

a. The basic characteristics are:

First symbol - type of modulation of the main carrier

Second symbol - nature of signal(s) modulating the main carrier

Third symbol - type of information to be transmitted.

b. Modulation used only for short periods and for incidental purposes (such as, in many cases, for identification or calling) may be ignored provided that the necessary bandwidth as indicated is not thereby increased.

(1) First Symbol - Type of Modulation of the Main Carrier

(a) Emission of an unmodulated carrier — N

(b) Emission in which the main carrier is amplitude modulated (including cases where sub-carriers are angle modulated):

1 Double-sideband — A

2 Single-sideband, full carrier — H

3 Single-sideband, reduced or variable level carrier — R

4 Single-sideband, suppressed carrier — J

5 Independent sidebands — B

6 Vestigial sideband — C

(c) Emission in which the main carrier is angle modulated:

1 Frequency modulation — F

2 Phase modulation — G

(d) Emission in which the main carrier is amplitude modulated and angle modulated either simultaneously or in a pre-established sequence: — D

(1) <u>First Symbol - Type of Modulation</u> (Contd.)

(e) Emission of pulses; i.e., emissions where the main carrier is directly modulated by a signal that has been coded into quantized for (e.g., pulse code modulation), should be designated under 8.b.(1)(b) or 8.b.(1)(c) above.

<u>1</u> Sequence of unmodulated pulses P

<u>2</u> Sequence of pulses

<u>a</u> modulated in amplitude. K

<u>b</u> modulated in width or duration. L

<u>c</u> modulated in position or phase. M

<u>d</u> in which the carrier is angle modulated during the period of the pulse. Q

<u>e</u> which is a combination of the foregoing or is produced by other means. V

<u>f</u> of cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes: amplitude, angle, pulse. W

<u>g</u> in cases not otherwise covered. X

G108. BASIC CHARACTERISTICS (Contd.)

(2) Second Symbol-Nature of Signal(s) Modulating the Main Carrier

(a) No modulating signal. O

(b) A single channel containing quantized or digital information without the use of a modulating subcarrier (this excludes time division multiplex). 1

(c) A single channel containing quantized or digital information with the use of a modulating subcarrier. 2

(d) A single channel containing analogue information. 3

(e) Two or more channels containing quantized or digital information. 7

(f) Two or more channels containing analogue information. 8

(g) Composite system with one or more channels containing quantized or digital information together with one or more channels containing analogue information. 9

(h) Cases not otherwise covered. X

(3) Third Symbol-Type of Information To Be Transmitted

In this context the word "information" does not include information of a constant unvarying nature, such as that provided by standard frequency emissions, continuous wave and pulse radars, etc.

(a) No information transmitted. N

(b) Telegraphy - for aural reception. A

(c)	Telegraphy - for automatic reception.	B
(d)	Facsimile.	C
(e)	Data transmission, telemetry, telecommand.	D
(f)	Telephony (including sound broadcasting).	E
(g)	Television (video).	F
(h)	Combination of the above.	W
(i)	Cases not otherwise covered.	X

G109. <u>OPTIONAL CHARACTERISTICS</u>

The optional additional characteristics, not normally required are:

Fourth symbol - details of signal(s)

Fifth symbol - nature of multiplexing

a. <u>Fourth Symbol - Details of Signals (s)</u>

(1)	Two-condition code with elements of differing numbers and or durations.	A
(2)	Two-condition code with elements of the same number and duration without error-correction.	B
(3)	Two-condition code with elements of the same number and duration with error-correction.	C
(4)	Four-condition code in which each condition represents a signal element (of one or more bits).	D
(5)	Multi-condition code in which each condition represents a signal element (of one or more bits).	E

G109. OPTIONAL CHARACTERISTICS

a. Fourth Symbol - Details of Signals (s) (Contd.)

(6)	Multi-condition code in which each condition or combination of conditions represents a character.	F
(7)	Sound of broadcasting quality (monophonic).	G
(8)	Sound broadcasting quality (stereophonic or quadraphonic).	H
(9)	Sound of commercial quality (excluding categories given in (10) and (11) below).	J
(10)	Sound of commercial quality with the use of frequency inversion or band-splitting.	K
(11)	Sound of commercial quality with separate frequency-modulated signals to control the level of demodulated signal.	L
(12)	Monochrome.	M
(13)	Color.	N
(14)	Combination of the above.	W
(15)	Cases not otherwise covered.	X

b. Fifth Symbol - Nature of Multiplexing

(1)	None.	N
(2)	Code-division multiplex (this includes bandwidth expansion techniques).	C
(3)	Frequency-division multiplex.	F
(4)	Time-division multiplex.	T
(5)	Combination of frequency-division multiplex and time-division multiplex.	W
(6)	Other types of Multiplexing.	X

G110. <u>EXAMPLES OF EMISSION DESIGNATORS BELOW 30 MHz</u>

DESIGNATOR	USE
NON	Unmodulated carrier, Continuous Wave.
2H50NON	TFMS, AN/TRQ-35(V).
100HA1A	CW Morse code - for aural reception.
280HF1B 280HJ2B	Narrow band direct printing (Maritime Mobile).
300HF1B 300HJ2B	Narrow band direct printing (170 Hz, 100wpm).
600HF1B	Single Channel Radio Teletype, TFMS W/CHIRPCOM.
1K08F1B	Single Channel Radio Teletype, (850 Hz, 60 wpm tty, wide shift).
1K24F1B	Single channel Radio Teletype, (850 Hz, 100 wpm tty, wide shift).
1K70J7B	SSB, suppressed carrier telegraphy (1).

DESIGNATOR	USE
2K04A2A 2K04A2D	Non directional beacons and radiolocation.
2K80H3E	SSB, full carrier, voice (Maritime Mobile).
2K80J2B	Audio freq tone shift/Telegraphy (Maritime Mobile and "OR").
2K80J2E	Secure KY65/75 ANDVT (Maritime Mobile)(Covered Voice).
2K80J2E	Facsimile, Exclusive Maritime Mobile Bands.

2K80J3E	SSB, suppressed carrier, voice (Maritime Mobile and "OR") (3).
3K00J2E	Secure KY 65/75 ANDVT (Fixed/Mobile)(Covered Voice).
3K00J3C	Facsimile.
3K00J3E	SSB, suppressed carrier, voice (Fixed/Mobile) (3).
3K00J7B	SSB, suppressed carrier telegraphy (2).
6K00B7D	ISB, data (Link 11).
6K00B9W	ISB, simultaneous voice and Multi-Channel Telegraphy.

NOTES:

(1) SSB suppressed carrier, amplitude modulated emission authorized for multi-channel operation for channels One through Eight of the Navy Tactical Multi-channel VFCT System (LF)

(2) SSB, suppressed carrier 100WPM 16 channels SSB RATT. (Authorized only for multi-channel RATT)

(3) Include Emission Note E029 on all assignments.

G111. <u>EXAMPLES OF EMISSION DESIGNATORS ABOVE 30 MHz</u>

<u>DESIGNATOR</u>	<u>USE</u>
NON	Unmodulated carrier
100HA1A	CW Morse Code - for aural reception
2K04A2A	Nondirectional beacon
6K00A3E	DSB, voice
3K00J3E	SSB, surpressed carrier voice
3K00J7B	SSB, surpressed carrier telegraphy
5M75C3E	Television, video

G111. <u>EXAMPLES OF EMISSION DESIGNATORS ABOVE 30 MHz</u> (Contd.)

DESIGNATOR	USE
6M00F3F	Television, video
70K0P0N	Radiolocation, mobile station (MR)
8M00PXX	Radiolocation, mobile station (MR)
350KP0N	Radiolocation, land station (LR)
1M00P0N	Radiolocation, land station (LR)
500KKXX	Experimental system (XT)
30K0F3E	VHF/FM, single chnl voice, 30-88MHz, uncovered
32K0F1E	VHF/FM, single chnl voice, 30-88MHz, KYV-2
32K0F1E	VHF/FM, single chnl voice, 30-88MHz, KY-67 (Bancroft)
37K5F1E	VHF/FM, single chnl voice, 30-88MHz, KY-8/28/38
32K0F1E	VHF/FM, single chnl voice, 30-88MHz, KY-57/58 ANDVT
37K5F1D	VHF/FM, single chnl data, 30-88MHz, KY-8/28/38
32K0F1D	VHF/FM, single chnl data, 30-88MHz, KY-57/58 ANDVT
30K0F1B	VHF/FM, single chnl 100WPM TTY, 30-88MHz, Wideshift
30K0F3C	VHF/FM, single chnl facsimile, 30-88MHz, uncovered
32K0F1C	VHF/FM, single chnl facsimile, 30-88MHz, KY-57/58 ANDVT
40K0F9W	VHF/FM, multi-chnl, 30-88MHz, 4 chnls

G111. <u>EXAMPLES OF EMISSION DESIGNATORS ABOVE 30 MHz</u> (Contd.)

DESIGNATOR	USE
80K0F9W	VHF/FM, multi-chnl, 30-88MHz, 8 chnls
6K00A3E	VHF/FM, single chnl voice, 118-137MHz, uncovered
16K0F3E	VHF/FM, single chnl voice, 138-174MHz, uncovered
20K0F1E	VHF/FM, single chnl voice, 138-174MHz, (DES)
6K00A3E	UHF, single chnl voice, 225-400MHz, uncovered
37K5A1E	UHF, single chnl voice, 225-400MHz, KY-8/28/38
25K0A1E	UHF, single chnl voice, 225-400MHz, KY-57/58 ANDVT
45K0F2D	UHF, Link 11, 225-400MHz
60K0F2D	UHF, Link 4A, 225-400MHz
1K40A1B	UHF, single chnl 100WPM TTY, 225-400MHz, 200Hz Shift
2K04A2A	UHF, homer beacon, 225-400MHz
25K0G7W	UHF, Satcom voice, 225-400MHz, covered/uncovered
20K0F1E	UHF, single chnl voice (DES) 406.1-420MHz
3M88G7W	SHF, satcom, TSE-85/TSC-93, 7-8GHz
1M00F9W	SHF, multi-chnl, LOS, 4.4-5GHz
2M50N0N	Tactical Freq Management System, AN/TRQ-35(V)
600HF1B	AN/TRQ-35(V) Chirpcom

G112. REFERENCE FREQUENCY

a. 3K00J3E (voice) and 3K00J7B (VFCT): The reference frequency is obtained by subtracting 1.5 kHz from the assigned frequency.

Example: Assigned 12962.7 kHz - Reference 12961.2 kHz.

b. 2K80J3E (voice): The reference frequency is obtained by subtracting 1.4 kHz from the assigned frequency.

Example: Assigned 17223.2 kHz - Reference 17221.8 kHz.

c. 1K24F1B (FSK) and 3K00F3C (Facsimile): The reference frequency is obtained by subtracting 2.0 kHz from the assigned frequency.

Example: Assigned 19027.5 kHz - Reference 19025.5 kHz.

d. 100HA1A (CW) and 6K00B9W/6K00B7D (Independent Side-Band): The reference frequency is the same as the assigned frequency.

Example: Assigned 10421.5 kHz - Reference 10421.5 kHz.

e. Common Examples of Assigned and Carrier Frequencies:

Designator	*/**	Assigned Frequency	Carrier Frequency
NON		K3037.5	K3037.5
2H50NON		M2-30	NONE
100HA1A		K4705.5	K4704.5
280HF1B		K4213.5	K4211.5
280HJ2B			
300HF1B		K4213.5	K4211.5
300HJ2B			

Designator	Assigned Frequency */**	Carrier Frequency
600HF1B	M2-30	NONE
1K08F1B	K11192.5	K11190.5
1K24F1B	K11192.5	K11190.5
1K70J7B	K135.95	K135.1
2K04A2A	K11192.5	K11192.5
2K04A2D		
2K80H3E	K13225.4	K13224
2K80J2B	K13225.4	K13224
2K80J2E	K13225.4	K13224
2K80J3C	K13225.4	K13224
2K80J3E	K13225.4	K13224
3K00J2E	K15055	K15053.5
3K00J3C	K15055.5	K15054
3K00J3E	K17415	K17413.5
3K00J7B	K15055.5	K15054
6K00B7D	K17982	K17982
6K00B9W	K18950	K18950

* Carrier Frequency/Reference Frequency/ Dial/Window/OFFSET are used interchangably.

** Carrier frequencies will NOT be "rounded off", up or down, to an even number.

G113. ABBREVIATIONS

For the purposes of this procedure and to achieve compatibility in the exchange and processing of data through use of automatic data processing (ADP) equipment, geographic place names must be fixed for maximum length. Accordingly, the state, country, or geographical division portion of the standardized geographic name has been fixed to a maximum of four letters. The abbreviations to be used for this portion are listed below. The name of the actual physical location of the transmitter/receiver site will be entered into SFAF Items 301 and 401.

G114. GEOGRAPHICAL ABBREVIATIONS

G115. STATES

AL	Alabama
AK	Alaska
AZ	Arizona
AR	Arkansas
CA	California
CO	Colorado
CT	Connecticut
DC	District of Columbia
DE	Delaware
FL	Florida
GA	Georgia
HI	Hawaii
ID	Idaho
IL	Illinois
IN	Indiana
IA	Iowa
KS	Kansas
KY	Kentucky
LA	Louisiana
ME	Maine
MD	Maryland
MA	Massachusetts
MI	Michigan
MN	Minnesota
MS	Mississippi
MO	Missouri
MT	Montana
NE	Nebraska
NV	Nevada
NH	New Hampshire
NJ	New Jersey
NM	New Mexico
NY	New York
NC	North Carolina
ND	North Dakota
OH	Ohio
OK	Oklahoma
OR	Oregon
PA	Pennsylvania
RI	Rhode Island
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VT	Vermont
VA	Virginia
WA	Washington
WV	West Virginia
WI	Wisconsin
WY	Wyoming

G116. COUNTRIES

ADL	Adelie Land
ADN	Aden
AFG	Afghanistan
AFI	French Territory of the Afars and the Issas
AFS	Republic of South Africa
AGL	Angola
ALG	Algeria (Algerian Democratic and Popular Republic)
AMS	New Amsterdam Island
AND	Andorra
AOE	Spanish Saharan Territory
ARG	Argentine Republic
ARS	Kingdom of Saudi Arabia
ASC	Ascension
ASO	South-West Africa
ATN	Netherlands Antilles
AUS	Commonwealth of Australia
AUT	Austria
AZR	Azores
B	Brazil
BAH	Bahamas
BCH	Republic of Botswana
BDI	Kingdom of Burundi
BEL	Belgium
BER	Bermuda

BLR	Belorussian Soviet Socialist
BOL	Bolivia
BRB	Barbados
BRM	Union of Burma
BRU	Brunei
BUL	Peoples Republic of Bulgaria
CAF	Central African Republic
CAN	Canada
CAR	Caroline Islands
CGO	Zaire (Republic of)
CHL	Chile (except Easter Island)
CHN	China (Peoples Republic of)
CHR	Christmas Island (Indian Ocean)
CKH	Cook Islands
CKN	Cook Island (Northern Group)
CLM	Republic of Columbia
CLN	Sri Lanka (Ceylon)(Republic of)
CME	Federal Republic of Cameroon
CNR	Canaries
COG	Peoples Republic of the Congo
COM	Comoro Islands
CPV	Cape Verde Islands
CRG	Khmer Republic
CTI	Republic of the Ivory Coast
CTR	Costa Rica
CUB	Cuba
CVA	Vatican City State
CYP	Republic of Cyprus
D	Germany
DAH	Republic of Dahomey
DGA	Diego Garcia
DNK	Denmark
DOM	Dominican Republic
E	Spain
EGY	Egypt (Arab Republic of)
EQA	Ecuador
ETH	Ethiopia
F	France
FJI	Fiji Islands
FLK	Falkland Islands and Dependencies
FNL	Finland
G	United Kingdom of Great Britain and Northern Ireland, the Channel Islands, and the Isle of Man
GAB	Gabon Republic
GCA	Territories and Colonies of the United Kingdom in Region 1
GCB	Territories and Colonies of the United Kingdom in Region 2
GCC	Territories and Colonies of the United Kingdom in Region 3
GDL	French Department of Guadeloupe
GHA	Ghana
GIB	Gibraltar
GIL	Gilbert and Ellice Islands
GLP	Persian Gulf
GMB	Gambia (Bathurst)
GNE	Republic of Equatorial Guinea
GNP	Portuguese Guinea
GRC	Greece
GRL	Greenland
GTM	Guatemala
GUB	Guyana
GUF	French Department of Guiana
GUI	Republic of Guinea
GUM	Guam
HKG	Hong Kong
HNB	Belize
HND	Republic of Honduras
HNG	Hungarian Peoples Republic
HOL	Kingdom of the Netherlands

HTI	Republic of Haiti
HVO	Republic of Upper Volta
HWL	Howland Island
I	Italy
ICO	Cocos Keeling Islands
IND	Republic of India
INP	Portuguese India
INS	Republic of Indonesia
IOB	British West Indies
IRL	Ireland
IRN	Iran
IRQ	Republic of Iraq
ISL	Iceland
ISR	State of Israel
IWA	Iwo Jima
J	Japan
JAR	Jarvis Island
JMC	Jamaica
JON	Johnston Island
JOR	Hashemite Kingdom of Jordan
KEN	Kenya
KER	Kerguelen Islands
KOR	Republic of Korea
KRE	Peoples Democratic Republic of Korea
KWT	State of Kuwait
LAO	Kingdom of Laos
LBN	Lebanon
LBY	Libyan Arab Republic
LNR	Republic of Liberia
LSO	Kingdom of Lesotho
LUX	Luxembourg
MAC	Macao
MAU	Mauritius
MCO	Monaco
MCS	Marcus Island
MDG	Malagasy Republic
MDR	Madeira
MDW	Midway Islands
MEX	Mexico
MLA	Malaysia
MLD	Republic of Maldives
MLI	Republic of Mali
MLT	Malta
MNG	Mongolian Peoples Republic
MOZ	Mozambique
MRA	Mariana Islands (Except Guam)
MRC	Kingdom of Morocco
MRL	Marshall Islands
MRN	Marion Islands
MRT	French Department of Martinique
MTN	Islamic Republic of Mauritania
MWI	Malawi
NCG	Nicaragua
NCL	New Caledonia and Dependencies
NGR	Republic of the Niger
NGU	Territory of New Guinea
NHB	New Hebrides (British-French Condominium)
NIG	Federal Republic of Nigeria
NIU	Niue Island
NOR	Norway
NPL	Nepal
NRU	Nauru Island
NZL	New Zealand
OCE	French Polynesia
PAK	Pakistan
PAP	Territory of Papua
PAQ	Easter Island, Chili
PHL	Republic of the Philippines
PHX	Phoenix Islands
PLM	Palmyra Island
PNR	Panama
PNZ	Panama Canal Zone
POL	Peoples Republic of Poland
POR	Portugal
PRG	Paraguay
PRU	Peru
PTC	Pitcairn Island
PTR	Puerto Rico
REU	French Department of Reunion
RHS	Rhodesia

ROD Rodriguez
ROU Socialist Republic of Romania
RRW Republic of Ruands
RYU Ryukyu Islands
S Sweden
SDN Republic of Sudan
SEN Republic of Senegal
SEY Seychelles
SHN S. Helena
SLM Solomon Islands
SLV Republic of El Salvador
SMA American Samoa
SMO Western Samoa
SMR Republic of San Marino
SNG Republic of Singapore
SOM Somali Democratic Republic
SPM St. Pierre and Miquelon
SRL Sierra Leone
STP Sao Tome and Principe
SUI Confederation of Switzerland
SUR Surinam
SWN Swan Island
SWZ Kingdom of Swaziland
SYR Syrian Arab Republic
TAI Taiwan
TCD Republic of the Chad
TCH Czechoslovak Socialist Republic
TGK United Republic of Tanzania (Tanganyika)
TGO Togolese Republic
THA Thailand
TKL Tokelau Islands
TMP Portuguese Tiwaziland Portuguese Timor
TON Tonga (Kingdom of)
TRC Tristan Da Cunha (Station of the Republic of South Africa)
TRD Trinidad and Tobago
TUN Tunisia
TUR Turkey
UGA Uganda
UKR Ukrainian Soviet Socialist Republic
URG Oriental Republic of Uruguay
URS Union of Soviet Socialist Republic
US 50 United States and the District of Columbia
USA The 48 Contiguous States of the United States of America and the District of Columbia (excludes the states of Alaska and Hawaii)
USP The United States (50 states and the District of Columbia), the Commonwealth of Puerto Rico, and the Territories and Possessions (but less the Canal Zone)
VEN Venezuela
VIR Virgin Islands
VTN Republic of Viet-Nam
WAK Wake Island
WAL Wallis and Futuna Island
YEM Yemen Arab Republic
YMS Yemen (Peoples Democratic Republic of)
YUG Federal Socialist Republic of Yugoslavia
ZAN United Republic of Tanzania (Zanzibar)
ZMB Republic of Zambia

G117. **AREAS**

AFR	Africa
ANTR	Antarctica
ARCO	Arctic Ocean
ASIA	Asia
CAM	Central America
CBN	Caribbean
EUR	Europe
FE	Far East
GLM	Gulf of Mexico
GTLK	Great Lakes (collectively)
INDO	Indian Ocean
LAM	Latin America
LANT	Atlantic Ocean
LERI	Lake Erie
LHUR	Lake Huron
LMIC	Lake Michigan
LONT	Lake Ontario
LSUP	Lake Superior
MDE	Middle East
MED	Mediterranean Sea
NAM	North America
NE	Near East
OCNA	Oceania
PAC	Pacific Ocean
SAM	South America
SAS	South Asia
SEA	South East Asia
SPCE	Space

ANNEX H

JAM RESISTANT COMMUNICATIONS

H101. GENERAL

a. The existence of an Electronic Countermeasures (ECM) threat to Navy's command and control communications is well recognized. Accordingly, the Navy has identified and documented a requirement to provide improved communications equipment to the fleet. The communications equipment will be designed to resist the jamming threat and, thereby, provide a medium for the continuous passage of command and control information. The Navy has established a two-phased program that responds to the requirement. During Phase I, the Navy will improve existing equipment by developing appliques and making slight modifications to make the equipment as jam resistant as possible. During Phase II, the experience and knowledge gained during Phase I will be applied to specific efforts to develop new hardware that is inherently jam resistant.

b. The Director, NAVEMSCEN provides allocation and assignment of frequencies to support modifications and equipments developed under the jam resistant program. NAVEMSCEN coordinates frequencies with other services and with allied countries for testing and operational use.

c. Jam resistant communications systems include airborne and surface equipments primarily providing single-channel line-of-sight and extended line-of-sight communications. The jam resistance capability is achieved through a class of bandwidth expansion known as spread spectrum modulation. In spread spectrum systems, the information signal is combined with a wider bandwidth signal that resembles noise. The spreading of this information signal over the wider bandwidth creates two distinct advantages. First, the output power is less, therefore, the signal is more difficult to detect. Secondly, it is much more difficult to jam than the narrow band signal since the jammer would have to cover such a wide frequency range. There are three types of spread spectrum techniques that are of primary interest to the Navy. These are direct Sequence Spread Spectrum, Frequency-Hopping Spread Spectrum, and Hybrid Spread Spectrum. Direct Sequence and Frequency-Hopping will be explained in detail in the following paragraphs.

H102. DIRECT SEQUENCE SYSTEMS

a. Spread Spectrum is a signal structuring technique that employs direct sequence, frequency-hopping or a hybrid of these, which can be used for multiple access and/or multiple functions. Spread Spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrow band information signal over a relatively wide band of frequencies. The receiver correlates the signals to retrieve the original information signal.

b. Direct Sequence Spread Spectrum is a signal structuring technique utilizing a digital code sequence having a chip rate much higher than the information signal bit rate. Each information bit of a digital signal is transmitted as a pseudo-random sequence of chips. The Joint Tactical Information Distribution System (JTIDS) is an example of a system utilizing Direct Sequence Spread Spectrum techniques. It also utilizes Frequency-Hopping Spread Spectrum techniques; however, the HAVE QUICK system will be described in Paragraph 7 as a Frequency Hopper. An overview of JTIDS is included in the following paragraphs.

H103. JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEMS (JTIDS)

H104. BACKGROUND

The Navy requires rapid transfer of critical, time sensitive information between the tactical elements that execute combat missions. The timely availability of target data is critical to the direction of quick and accurate fires on hostile targets. In aircraft carrier operations, the track hand overs and target engagement take place within seconds. Time delay can not be tolerated. JTIDS is a tactical communications program being developed by the DoD to provide this timely distribution of critical information. The system is being developed under a joint venture of Hughes Aircraft Company and the ITT Corporation. Typical Navy users of the system will include CVs, CEs, DDGs, E-2Cs, F-14s, Naval Tactical Data System (NTDS), Air Tactical Data System (ATDS), Marine Aviation Command and Control System (MACCS), Marine Integrated Fire and Air Support System (MIFASS), and Tactical Air Operations Centers (TAOCs).

H105. GENERAL DESCRIPTION

a. JTIDS is an integrated communications, navigation, and identification system that employs a low duty cycle, spread spectrum waveform, and direct sequence signal coding. The result is a secure, jam-resistant communications system with a low probability of interception and exploitation. The dual-mode terminals feature Distributed Time Division Multiple Access (DTDMA) for high capacity and flexibility and Time Division Multiple Access (TDMA) for interoperability with the other services and with NATO.

b. The working output of the JTIDS system is high energy, short duration pulses that are pseudo-randomly distributed in time and frequency. This system provides a very high throughput while maintaining a very low profile, a low density of pulse, and a high resistance to jamming.

c. The typical categories of traffic that will be handled by the JTIDS system include voice conferencing, control voice and data, position and identity, navigation, relaying, TACAN, surveillance data, and weapon control. The different classes of platforms have different tactical communications, navigations, and identifications requirements. JTIDS provides a family of equipments and these varying requirements can be satisfied by selecting the appropriate combination of transmitters and receivers. Four sizes of terminals are being developed to satisfy surface, airborne/surface, high capacity tactical aircraft, and austere multi-platform requirements. These terminals have different levels of cost and complexity, but all employ the Direct Sequence or Frequency-Hopping coding techniques, hence, are jam resistant.

H106. FUNCTIONAL DESCRIPTION

a. JTIDS communications transmissions include three components: message synchronization, communications management header, and data/information. The message synchronization information enslaves the receiver to operate in synchronization with the transmitter. The communications header is used for conventional management purposes such as source, relay directions, and signalling protocols. The digital data stream may be coded or uncoded and may convey voice or data. When the transmissions are unusually long, the synchronization and header information may be periodically repeated to ensure continuity of transmission. The terminal equipment is designed to internally digitize multiple Joint/NATO standard 16 kbps voice channels. Other voice rates that are digitized externally can be entered through a serial data port.

b. The JTIDS equipment uses Continuous Variable Slope Delta (CVSD) techniques to digitize 16 kbps voice. It provides the capability for half-duplex, push to talk channels, and full duplex conferencing channels.

c. Error correction in JTIDS equipment is accomplished through forward error coding and parity checking. The error correction system is so powerful that erasures of up to 16 five-bit symbols can be tolerated without loss of the basic 70 bits of data included in a formatted data communication.

H107. FREQUENCY-HOPPING SYSTEMS

Frequency-Hopping Spread Spectrum is a signal structuring technique employing automatic switching of the transmitted frequency. Selection of the frequency to be transmitted is typically made in a pseudo-random manner from a set of frequencies covering a band wider than the information bandwidth. The intended receiver hops in synchronization with the transmitter in order to retrieve the desired information. The HAVE QUICK system is a jam-resistant system that employs the Frequency-Hopping technique. HAVE QUICK is explained in more detail in the following paragraphs.

H108. HAVE QUICK

H109. BACKGROUND

The vulnerability of UHF radios (225-400 MHz) to jamming has been recognized since early in the 1970s. The tactical radios that provide the medium for command and control of tactical forces operate in the UHF portion of the spectrum. Therefore, their vulnerability to jamming generated the need for a method of providing protection. HAVE QUICK was developed to solve this problem. HAVE QUICK provides an air-air and air-ground-air jam resistant UHF voice communications capability. The system is based on demonstrated technologies, can be applied to existing communications equipments, requires minimum modification to aircraft or ground equipment, is accomplished at the field maintenance level, and is relatively inexpensive.

H110. GENERAL DESCRIPTION

The HAVE QUICK system consists of a modification kit and an existing ground or airborne UHF radio. When operating in the jam resistant mode, the system rapidly changes frequency according to a preestablished code. It is difficult for an adversary to jam the system, because without the code, there is no way to synchronize the jammer with the system. Part of the jam resistant success of HAVE QUICK also comes from the pseudo-random manner in which the hopping takes place. The casual observer does not see a pattern. Therefore, jamming is extremely difficult.

H111. FUNCTIONAL DESCRIPTION

The HAVE QUICK system stores a pattern of frequencies for a specific day, and when implemented, uses these frequencies according to the specific time of the day. The time of the day is divided into slots where each slot is a fraction of a second. During each slot, there is a specific frequency on which the radios in the net must operate. Therefore, each terminal in the net must have two critical elements: a means to shore the hopping pattern, and a very accurate clock that is in synchronization with the master clock of the net. The system employs coordinated Universal Time from the TRANSIT satellite system as practical convenience to satisfy this timing requirement.

H112. IMPACT OF JAM RESISTANT SYSTEMS ON SPECTRUM MANAGEMENT

H113. GENERAL

a. The jam resistant communication will have an impact on management of the spectrum. However, these systems will not cause a change to the current procedures for allocating and assigning frequencies. The primary impact will be in the area of coordination. On the one hand, conventional systems require frequencies of a few kilohertz, while on the other hand, jam resistant systems can require up to 25 Megahertz of contiguous bandwidth. The coordination problem is more acute with Direct Sequence systems than with Frequency-Hopping systems. In the case of the Frequency-Hopping systems, while the frequency bandwidth may be the same as in Direct Sequence systems, the actual occupied frequency may be for only a fraction of a second. One distinct advantage of the Direct Sequence Modulation technique is the low power of the output signal. Clearly, lower power outputs equate to reductions in the amount of interference these systems create for other systems. Actually, this helps the coordination process. Coordination for Frequency-Hopping is more acute with respect to power because the output power per hertz is greater than Direct Sequence Systems.

b. The specific impact of jam resistant systems on spectrum management depends on the bandwidth and the bands of frequencies occupied. The wider bandwidths require more coordination. The amount of coordination is governed by the services to be provided and protected, the frequency separation, the type of interference potential, and the characteristics of the potential victim receivers. One potential problem with worldwide employment of these systems is the unique band allocations to different nations. While bands are allocated by the International Telecommunication Union for specific services, each nation may take exception to the ITU allocation. As a result of this, jam resistant systems that are clear to use certain bands in the United States and Possessions, may not be clear to use these bands in Italy or Germany, for example. One final coordination problem is that an equipment allocated to operate in a nation's prohibited band may be withheld from use in the nation's coastal waters or within interference range of its operating systems.

H114. SPECTRUM MANAGEMENT OPERATIONS

There are several distinct advantages that accrue with the employment of jam resistant systems. The first is that only a receiver that has been assigned the same code as the transmitter will be able to receive the signal, decode it, and extract the intelligence. Therefore, an exclusive mode of operation could be employed where a different code could be assigned to each receiver. Then the transmitter could call each receiver individually by employing the code for that receiver. The other receivers in the net would not receive that transmission. Another spectrum management advantage is that different code sequences may be assigned to adjacent systems using the same band of frequencies. In other words, the two adjacent systems would share a common frequency allocation and operate simultaneously without mutual interference. Another advantage is that jam resistant systems, when operating in the anti-jam mode, do not cause or receive interference from systems operating in the conventional mode.

H115. SUMMARY

a. In summary, the threat to the Navy's command and control communications is a real one. However, specific action has been taken to counter that threat. Seizing the opportunity to take advantage of advancing technology, the Navy has developed a two-phase program. The first phase provides a jam resistant capability for the near term. The program is HAVE QUICK, a system that applies Frequency-Hopping Spread Spectrum techniques to existing radio equipment. The result is an effective communications system that boasts improved throughput even in an ECM environment.

b. The second phase will provide jam resistant communications equipment for the long term. Joint Tactical Information Distribution System (JTIDS) is an example of equipment being developed for the long term. JTIDS will have a Direct Sequence and Frequency-Hopping Spread Spectrum capability. This system will, like HAVE QUICK, continuously provide the communications essential to effect command and control and support of forces and ensure success in battle. It is anticipated that these systems will not cause a significant change in the frequency allocation and assignment process. Coordination at the local level will require more attention because of the wider bandwidths used by these systems.

ANNEX I

CHIRPSOUNDER HIGH FREQUENCY TACTICAL FREQUENCY MANAGEMENT SYSTEM

I101. GENERAL

a. The purpose of this Annex is to provide information to assist naval spectrum management personnel in managing that portion of the spectrum below 30 MHz. It describes the use of ionospheric sounding and the operation and use of the CHIRPSOUNDER High Frequency Tactical Frequency Management System (TFMS), AN/TRQ-35. It also describes the procedure that frequency managers will use to obtain clearance to operate, and frequency assignments to operate the CHIRPSOUNDER equipment.

b. Radio communication equipment that operates in the High Frequency, HF, segment of the electromagnetic spectrum depends heavily on the ionosphere for its operation. The ionosphere is that portion of the earth's atmosphere between the stratosphere and the exosphere. It extends from about 81 kilometers (50 miles) to about 483 kilometers (300 miles) above the earth. The ionosphere is composed of electrically charged atoms or molecules. This fact is of great interest to communicators because these charged atoms or molecules act as reflectors of radio waves which makes long distance radio communication possible. Radio waves, particularly those in the HF portion of the spectrum, can be radiated from a transmitter toward the ionosphere. They are reflected from the ionosphere back to earth to be received by a collocated or distant receiver depending on the angle of reflection.

c. During the early history of radio communication, HF was extensively used. Shortly after World War I, researchers began to study the characteristics of the ionosphere and to conduct HF sounding. Sounding is a technique of bouncing an HF wave off the ionosphere and analyzing the reflected signal to draw conclusions about the characteristics of the ionosphere. This research greatly benefitted communicators around the world. It:

(1) Gave information about the atmosphere,

(2) Paved the way for the development of improved hardware,

(3) Led to the improvement of HF sky wave communications, and

(4) Led to the development of over-the-horizon radar.

Sounding is accomplished in two ways. Vertical Incidence Sounding (VIS) is accomplished by radiating the signal straight up and the ionosphere reflecting it back to a collocated receiver. Oblique Incidence Sounding (OIS) is accomplished by reflecting the radiated signal off the ionosphere to a distant receiver.

d. It was about 1932 when the first VIS system was developed and put into use. It employed a collocated transmitter and receiver. The reflected waves from the ionosphere were read on a scope to gather information about the ionosphere. After World War II, researchers developed a keener interest in OIS because they could get a clearer picture of the ionospheric influence on the actual communications path. This was especially true if the OIS path coincided with the communications path. An extensive network of OIS systems was installed as a result of this increased interest which led to a number of studies in the sixties and seventies.

e. Prior to the emergence of sounding, climatological predictions guided the selection of frequencies for HF communications paths. However, these predictions were only as reliable and accurate as forecasting the weather. Ionospheric sounding is particularly rewarding to the frequency manager especially in those circumstances where the sounding path is along the same direction as the communication path. Ionospheric sounding provides:

(1) Improved and more reliable communications,

(2) More effective and efficient use of the electromagnetic spectrum,

(3) Faster set up and operation of equipment,

(4) Shorter down times due to ionospheric changes,

(5) Improved operator and maintenance performance, and

(6) Improved compatibility with automated procedures.

I102. CHIRPSOUNDER PLANS

a. The Navy, as well as the other services and DISA, is installing the TFMS (AN/TRQ-35) at a number of locations to support tactical operations. This sounding system is being installed to help maintain reliable HF communications. Unified Commanders will promulgate policies and plans for their areas of operations and the Military Communications-Electronics Board will publicize clock and start times for all global operations (will be published in ACP 191 ( )).

b. The Navy is installing the TFMS both ashore and afloat. Generally, the shore stations will be equipped with the transmitter, TCS-4B, while the ship stations will have the receiver, RCS-4B.

I103. OPERATIONAL PROCEDURES

a. Unlike line-of-sight communications, High Frequency communications requires constant management and attention to select the best operating frequencies as the characteristics of the ionosphere change over a 24-hour period. It is necessary to select the best operating frequencies for the particular ionospheric state.

b. The transmitter, TCS-4B, emits a continuous wave signal that sweeps upward in frequency at a linear rate. The receiver, RCS-4B, tunes through the frequency range in synchronization with the transmitter and receives any radiated energy that is reflected by the ionosphere. Working in conjunction with the receiver, the Spectrum Monitor, RSS-4B, locates and identifies clear, interference-free, channels within the bands of the HF spectrum. The monitor can separately store and display data for 9333 6 kHz channels in the 2-30 MHz frequency range. Using this information, spectrum managers get a clear indication of channels that can be used for establishing more reliable communications or restoring deteriorating communications circuits.

I104. ALLOTMENT AND ALLOCATION PROCEDURES

a. The TFMS is a communications system in its own right. Therefore, as a user of the spectrum, its operation must be managed just as any other communications system. The MCEB and Unified Commanders have established worldwide DoD chirpsounder allotments and procedures to assure compatibility and reduce interference. The MCEB issues chirpsounder frequencies and start time assignments within the US&P. Commands must coordinate requirements with MCEB using the 00-01 time increment allotted as follows:

00-01	FP
01-02	CINCLANT
02-03	USCINCEUR
03-04	CINCPAC
04-05	USCINCSO

All other requirements will be forwarded to NAVEMSCEN for resolution and assignment.

b. Requests will be forwarded using the SFAF for a Below 30 MHz assignment, Annex D-3, NTP 6. An example of the entries for selected data items is as follows:

005.	U
010.	N
110.	K2000-K16000
113.	SN
114.	2H50N0N
115.	W10
130.	1HX
140.	870101

144. U

200. USN

203. CINCPAC

207. NCSPHIL

208. N52618

c. Requests for assignment will not include clock start times. NAVEMSCEN will assign start times in Item 502 of the final assignment/notification message.

d. Chirpsounders will not be operated on 2182, 2500, 3023, 5000, 8364, 10000, 13360-13410, 15000, 20000, 25000 (all kHz) and associated guard bands. The signal blanking capability of the chirpsounder transmitter will be used for this purpose. (See ANNEX D, paragraph 15.e.(2)).

ANNEX J

SPECIFIC OPERATIONS IN SELECTED FREQUENCY BANDS

J101. INTERNATIONAL FREQUENCY ALLOCATION.

The International Telecommunication Union (ITU) has allocated bands of the frequency spectrum for particular radio services. The entire list of these services and frequency bands, known as the ITU Allocation Table, forms the basis for further allocation and assignment of frequencies for national and international use. For the purpose of frequency allocation, ITU has divided the world into three geographic regions. Frequency allocations are listed by region for specific services. Types of services may be the same in each region (such as certain broadcast bands), or they may vary between regions according to international agreement.

J102. NATIONAL FREQUENCY ALLOCATION.

The National Table of Frequency Allocations is composed of frequency bands allocated for US Government, nonfederal, and shared use. This table is used as a planning guide and does not constitute authority to operate. Federal government use of the frequency spectrum is administered by NTIA. Non-government use is administered by the FCC.

J103. REGULATING EMISSION CHARACTERISTICS.

Frequency management includes defining and controlling the parameters of the transmissions made within allocations. Considerations such as bandwidth, types of modulation, modes of emissions, stability, and levels of spurious and harmonic emission must be precisely identified to allow frequency managers to plan for efficient use of the electromagnetic spectrum. Emissions are categorized according to the type of modulation of the main carrier, nature of signals modulating the main carrier, and type of information to be transmitted. The symbol for the emission is preceded by four alphanumeric characters indicating the necessary bandwidth of the emission. Bandwidths are expressed to a maximum of five significant figures. If the equipment operates in more than one mode of emission, the corresponding emission designators must be identified and authorized (maybe add an attachment). Such parameters as frequency stability, bandwidth, and levels of spurious emission vary greatly with the type of service and the particular part of the spectrum used.

J104. AERONAUTICAL OPERATIONS (225-400 MHz).

Within the US&P, the basic channeling plan for the band will be 25 kHz; the channel will be centered on 225.025 MHz and the last on 399.975 MHz. The 328.6-335.4 MHz band is allocated only for instrument landing system (ILS) glideslope operations. Fixed, multichannel radio relay equipment will not be permitted to operate in the 225-400 MHz band within the US&P except in tactical exercises or unless it is demonstrated that its use is the only effective way to satisfy a requirement.

J105. AIR TRAFFIC CONTROL (ATC) FREQUENCIES.

ATC frequencies are used to control the movement of aircraft (taxiing, departing and approaching air terminals, and e route in controlled air space) and will not be used for any other purpose. Power for ATC ground-controlled frequencies is limited to 10 watts. Requests for power above 10 watts must be fully justified. Additionally, activities will use ATC ground-control frequencies only for communications between control towers and aircraft and vehicles in the aircraft movement area.

J106. NAVIGATIONAL AID (NAVAID) FREQUENCIES.

NAVAIDs assist in the safe and efficient operation of civil and military aircraft. Aeronautical NAVAIDs and their allocated frequency bands are:

a. Instrument Landing System (ILS). The ILS provides guidance for an aircraft on final approach to a runway. Its functional components are:

(1) Marker Beacon. Operating on a standard frequency of 75 MHz, the marker beacon indicates a specific location along the final instrument approach.

(2) Localizer. The ILS localizer, operating in the 108.0 - 117.9875 MHz band, transmits horizontal guidance signals which direct the aircraft to the runway centerline. The localizer also transmits a Morse code airfield identification consisting of the letter "I", followed by a unique three-letter identifier.

(3) Glideslope. The ultra-high frequency glideslope transmitter, operating in the 328.6-335.4 MHz band, provides vertical guidance for a safe descent to the runway. Glideslope and localizer frequencies are always paired to conform with the (national, international) channeling plan.

b. Tactical Air Navigation (TACAN). The normal TACAN system consists of a ground transponder, which operates in the 962-1024 MHz or 1151-1213 MHz band, and an airborne interrogator that operates in the 1025-1150 MHz band. A unique three-letter identifier positively identifies the ground facility. In the "X" configuration, the ground reply frequency is 63 MHz less than the airborne frequency for channels 1-63 (low band); for channels 64-126 (high band), the ground frequency is 63 MHz higher than the airborne frequency. In the "Y" configuration, the ground reply frequency is 63 MHz higher than the airborne frequency for channels 1-63 and 63 MHz lower than the airborne frequency channels 64-126. The ground-transmit frequency is assigned and the use if its paired airborne frequency is assumed. TACAN channels 1-16 and 60-69 are reserved for military tactical and training operations, while the remaining 100 "X" channels are used by the common civil-military national airspace system. Make sure procedures governing use of civil TACAN channels for air-to-air operations are followed explicitly.

c. Very High Frequency (VHF) Omnidirectional Range (VOR). VOR facilities operate in the 108-118 MHz band. They provide bearing information to aircraft. Most VORs use voice and Morse Code transmissions for positive identification of the ground facility.

d. TACAN and VOR or ILS Paired Frequencies. A TACAN can operate in conjunction with a VHF facility (VOR or ILS) to form a single, unified NAVAID. To be considered a single NAVAID, both facilities must be located in the same place, transmit simultaneously on a paired channel and share the same three-letter identifier. If the antenna separation exceeds 610 meters

(2,000 feet), the facilities do not constitute a single NAVAID and must use unpaired channels and different identifiers. Only the FAA may waive this requirement. To be considered collocated, the facilities must meet one of the following criteria:

(1) For stations used in terminal areas for approach procedures, the separation for a standard VOR antenna and the associated distance measuring equipment (DME) or TACAN antenna will not exceed 30.48 meters (100 feet).

(2) For a Doppler VOR antenna and associated DME or TACAN antenna, separation will not exceed 79.25 meters (260 feet).

(3) For facilities providing only e route services, the antenna separation will not exceed 610 meters (2,000 feet).

e. Air Traffic Control Radar Beacon System (ATCRBS), Identification Friend or Foe (IFF) and Selective Identification Feature (SIF). This system operates on the standard transmit frequency of 1030 MHZ for the ground interrogators and is normally slaved to the airport surveillance radar (ASR). Airborne transponders operate at 1090 MHz. The power of beacon interrogators associated with terminal surveillance will normally be 300 watts. Requests for additional power must be justified. Beacon ramp tester units will be limited to 4 watts of transmitter power to the antenna and pulse repetition rate (PRR) of 230 pulses per second (PPS), triggered for stability. PRRs for ATCRBS, IFF, or SIF are normally the same as, or submultiples of the ASR's PRR but may operate in a staggered mode with an ASR which operates with a staggered PRR.

f. Low Frequency (LF) and Medium Frequency (MF) Nondirectional Beacon Frequencies. Frequencies used for LF or MF radio beacon operations range from 70 to 2000 kHz. In the US, the Navy normally operates in the 30-300kHz and 300-3000kHz bands.

g. Aeronautical Radio Navigation Radar Frequencies. The bands 1300-1350 (normally used for long-range radar (LRR), 2700-2900 MHz (normally used for ASR), and 9000-9200 MHz (normally used for precision approach radar (PAR), are allocated to the aeronautical radionavigation service on a primary basis. Special instructions for applications requiring frequencies in these bands are described in paragraph 15, Annex D. In certain areas of the US, it may be difficult to accommodate new radars in the 2700-2900 MHz band.

h. Long-Range Navigational (LORAN) Frequencies. LORAN C stations operate in the 90-110 kHz frequency bands. All stations use a center frequency of 100 kHz, at different PRRs. There are six basic PRRs: H (33-1/3 PPS), L (25 PPS), S (20 PPS), SH (16-2/3 PPS), SL (12-1/2 PPS), and 22 (10 PPS).

J107. TESTING CHANNELS FOR NAVAIDS.

VOR frequency 108.0 MHz, TACAN channel 17, ILS frequencies 108.1 MHz (localizer) and 334.7 MHz (glideslope) are reserved for equipment testing in the US&P. However, this is not automatic authority to conduct tests on these frequencies. Application and assignment actions are required.

J108. TELEMETRY FREQUENCIES.

Telemetry operations in aeronautical vehicles, upper atmosphere research devices, guided missiles, space system boosters, and space vehicles are allocated the following bands of frequencies under the conditions prescribed below.

a. The 1435-1535 MHz and 2310-2390 MHz Bands. For frequency assignment, see paragraph 15k, Annex D.

(1) Assignments will be centered on frequencies at standard intervals of 1 MHz, beginning at 1435.5 and 2310.5 MHz, respectively, and will be authorized bandwidths of 1, 3, or 5 MHz. Assignments with bandwidths greater than 1 MHz will be centered so they do not extend outside the allocated bands.

(2) Certain 1 MHz channels, within the 1435.1535 MHz (99 channels) and 2310-2390 MHz (79 channels) bands are designated primarily for telemetry and associated telecommand during the flight testing of aircraft, missiles, or major components (station classes MOEA, FLEA, MOD, FLD).

(3) Frequencies 1444.5, 1453.5, 1501.5, 1515.5, 1524.5, and 1525.5 MHz will be shared with flight telemetry mobile stations (station classes MOEB, FLEM, MOD, FLD).

(4) Telemetry associated with launching and re-entry into the earth's atmosphere, as well as incidental orbiting before re-entry, of occupied or unoccupied objects undergoing flight tests (station classes MOEA, FLEA, MOB, FLD apply), is also permissible within these bands.

(5) Telecommand stations authorized to operate in these bands must directly support telemetry functions. They are limited to 1 MHz bandwidth, and must use antennas having a half-power beamwidth of no more than 8 degrees and a front-to-back ratio of at least 20 dB.

(6) In the 1435-1535 MHz band, channels designated for aeronautical telemetry are also available for space telemetry on a shared basis.

b. The 2200-2300 MHz Band. Between 2200 and 2290 MHz band, 90 1-MHz narrowband channels are designated, centered on 2200.5 MHz and each 1-MHz increment through 2289.5 MHz.

(1) The use of emission bandwidths greater than 1 MHz is permitted, provided the assigned frequencies are centered on the center frequencies of narrowband channels.

(2) These channels are available for:

(a) Telemetry from space research space stations.

(b) Aeronautical telemetry, including telemetry associated with launch vehicles, missiles, and upper atmosphere research rockets, is on a coequally shared basis with fixed and mobile line-of-sight operations.

(c) No provision is made in this band for flight testing of piloted aircraft.

J109. INTERNATIONAL DISTRESS AND EMERGENCY FREQUENCIES.

The U.S. Government and DoD have adopted the international distress and emergency frequencies shown below. Assignment of these frequencies to locations is not required. These emergency frequencies are used primarily by stations operating in the maritime and aeronautical mobile service. If a mobile station is in distress is unable to make contact on emergency frequencies, it may use any available means to obtain assistance. Policies for using these frequencies follow:

FREQUENCY	SERVICE	FUNCTION
500 kHz	Aeronautical, Maritime Survival Craft	Distress (Telegraphy)
518 kHz	Maritime Mobile	Meterological and Navigational Warnings
2182 kHz	Aeronautical, Maritime Survival Craft	Distress
4125 kHz	Aeronautical, Maritime Survival Craft	Distress and Safety
6215 kHz	Aeronautical, Maritime Survival Craft	Distress and Safety
8364 kHz	Aeronautical, Maritime	Search and Rescue
121.5 MHz	Aeronautical	Distress and Urgency
123.1 MHz	Aeronautical	Distress and Urgency
156.3 MHz	Aeronautical, Maritime	Search and Rescue
156.65 MHz	Maritime	Ship to Ship Safety of

FREQUENCY	SERVICE	FUNCTION
		Navigation
156.8 MHz	Maritime	Call, Reply, and Safety
243.0 MHz	Military Aeronautical	Emergency, Survival

HF FREQUENCIES FOR DISTRESS AND SAFETY

The following table describes the distress and safety frequencies between 4000-27500 kHz for ship and coast stations, public and private, operating radio-telephony (HF-SSB), narrow-band direct-printing (NBDP), and digital selective calling (DSC).

Frequency (kHz) prior to July 1, 1991	Frequency (kHz) as of July 1, 1991
HF-SSB	HF-SSB
4125.0	no change
6215.5	6215.0
8257.0	8291.0
12392.0	12290.0
16522.0	16420.0
NBDP	NBDP
4177.5	no change
6268.0	no change
8357.5	no change
12520.0	no change
16695.0	no change
DSC	DSC
4188.0	4207.5
6282.0	6312.0
8375.0	8414.5
12563.0	12577.0
16750.0	16804.5

a. Emergency Broadcasts. The distress call or message will be sent only on the authority of the person responsible for the ship, aircraft, or other vehicle carrying the mobile station. The emergency frequencies are used only for actual emergencies and not for simulated emergency training. Detailed instructions and policy concerning operational procedures for use of distress and emergency frequencies appear in ACT 135, Communication Instructions - Distress and Rescue Procedures.

b. Testing Restrictions. Testing an emergency frequency during experimental, production, or maintenance operations must not cause radiations into free space. Make operational checks to ensure proper system operation (confidence checks) no more than once in any 24-hour period, and keep them as short as possible. Activities completing a communications contact on equipment used for emergency purposes will consider the contact as the confidence check for that period. Activities will make confidence checks only with stations authorized to operate on the particular emergency frequency. In no event will activities transmit "in the blind" for confidence checks.

J110. STANDARD FREQUENCY AND TIME BROADCASTS.

Frequencies have been nationally and internationally allocated and assigned to designated stations to broad-cast time and frequency signals for setting chronometers and calibrating frequency-sensitive equipment. The standard frequencies are 60 kHz and 2.5, 5, 10, 15, 20 MHz. The following are key points concerning the national and international standard broadcasts:

a. US Standard Broadcasts. The National Bureau of Standards (NBS), US Department of Commerce, operates two high-frequency (HF) radio stations: WWV near Fort Collins, Colorado, and WWVH at Kauai, Hawaii. Each broadcasts highly accurate frequency and time signals. The coordinates of WWV are 404049N1050227W. The coordinates of WWVH are 215926N1594600W. The transmitted frequencies of both stations are accurate to within one part in 100 billion. NBS also operates a low-frequency (60 kHz) station, WWVB, near Fort Collins, Colorado. These three stations are used to coordinate the global networks of missile and private efforts requiring accurate time and frequency and improve the uniformity of frequency measurement nationally and internationally. They provide an accurate frequency standard easily available to many users for electronic research and development. NBS Special Publication 432, Frequency and Time Services Bulletin, contains additional information on NBS services, including frequency and power of NBS transmitters.

b. Foreign Broadcasts. Many radio stations throughout the world broadcast standard time and frequency signals. Two of the most widely known and used are:

(1) The Canadian Dominion Observatory, Ottawa, Ontario, which continuously broadcasts standard frequency and time signals over station CHU. The broadcast frequencies are 3330.7335 and 14670 kHz.

(2) The Tokyo Astronomical Observatory, which broadcasts standard time and frequency signals over station JJY on 2.5, 5, 10, and 15 MHz. Note: A complete list of domestic and foreign stations which furnish standard radio time and frequency signals, plus an explanation of the various time signal systems, is in the Hydrographic Office Publication 2-5, Radio Navigational Aids, published by the US Navy Hydrographic Office. The Joint Army, Navy, and Air Force Publications (JANAP) 145-series lists Navy and Coast Guard broadcasts.

J111. DoD USE OF FREQUENCIES IN NON-GOVERNMENT BANDS.

Certain frequencies allocated for non-government use may be designated for military use on a secondary, noninterference basis, consistent with the information in subparagraphs a through c below. In all cases, the user must request authorization for specific frequencies and thoroughly coordinate the request with other users.

a. Frequencies in the 4-40 MHz Band. Activities may use frequencies allocated to the Maritime Mobile (MM) Service and the Broadcast (BC) Service in the 4-20 MHz band for peacetime military tactical and training purposes within the US&P. Normally, tactical Naval and Marine Corps units use these frequencies for portable and mobile operations in the field. The FCC has established criteria for limiting military transmitter power to the minimum necessary for reliable communications and will not exceed the power for specific types of emissions.

When notified by the FCC or other authority that Naval or Marine Corps transmissions are interfering with an MM or BC station, the unit must cease operation on that frequency. Units can expect to receive interference at any level of command. However, the unit can submit a request for a replacement frequency through normal frequency management channels.

b. Frequencies for Military Test Range Operations. The FCC and the military departments have arranged for the military use of non-government bands at certain military test ranges. The following figures show the frequencies that activities may use for these purposes. They will not use these frequencies if they can satisfy frequency requirements with government bands. They will limit operations on these frequencies if they can satisfy frequency requirements with government bands. They will limit operations on these frequencies to those intermittent operations that can stop immediately upon notice that they are causing harmful interference. At certain military test ranges, JFMO and NFCWUS may authorize peacetime military use of non-government frequencies in the 25-2400 MHz band after coordination with FCC field personnel, providing there is no harmful interference to non-government operations.

c. Amateur Frequencies. The military services will not use amateur frequencies within the US&P during normal peacetime conditions, except as authorized by NTIA or FCC. Frequencies and emissions shown below are for use in emergency areas when required to make initial contact with Radio Amateur Civil Emergency Services (RACES) stations. Activities may also use these frequencies for communications with RACES stations on matters requiring coordination.

d. Commercial Broadcast Frequencies. The military Services will not use commercial broadcast frequencies within the US&P during normal peacetime conditions, except when authorized by NTIA or by the FCC.

J112. FREQUENCIES FOR LAND MOBILE RADIO (LMR) SYSTEMS AND PAGERS.

LMR and pager operations in the US&P are conducted in the 29.89-50, 138-144, 148-150.8, 162-174, and 406-420 MHz bands. The following conditions, restrictions, and special provisions apply:

a. The 29.89-50 MHz Band. This band is shared by both government and non-government agencies. Military and nonmilitary agencies share the government use of the band. Because of extensive use, frequencies are very limited. Frequencies are channeled in 20 kHz increments, beginning with 29.90 MHz. Frequency 40.5 MHz is the joint military common frequency for calling and for emergency communications within the US&P. Assignment of this frequency is not required.

b. The 138-144 MHz Band. Only the military Services use frequencies in the 138-144 MHz band. Channels are allotted in 25 kHz increments, beginning with 138.025 MHz.

c. The 148-150.8 MHz Band. This is also a military band, which is channeled in 25 kHz increments, beginning with 148.025 MHz. These frequencies are heavily used throughout the United States.

d. The 162-174 MHz Band. Non-military government agencies are primary users of the frequencies in the 162-174 MHz Band. Channels are allotted in 25 kHz increments, beginning with 162.025 MHz. Because this band is extremely congested, it is Navy policy to satisfy new LMR and pager requirements from other frequency bands, where and if possible. Assignments in the 162-174 MHz band will be made only in the following cases:

(1) When the frequency is needed for dual-channel operation with an existing net that operated in the 162-174 MHz band.

(2) When the frequency of a net operating in the 162-174 MHz band must be changed because of interference problems.

(3) When an existing 162-174 MHz frequency assignment will be shared with another unit at the same location.

e. The 406-420 MHz Band. This band is used primarily by the nonmilitary government agencies. Frequencies are channeled in 25 kHz increments, beginning with 406.125 MHz.

J113. <u>REALIGNMENT OF OFF-CHANNEL LMR FREQUENCY ASSIGNMENTS</u>.

A US Military Communication-Electronics Board (US MCEB) 25 kHz channel allocation plan governs LMR frequency assignments in the 138-150.8 MHz band. Existing assignments within the US&P that do not conform with the plan will be adjusted as soon as possible; LMR frequency assignments not divisible by 25 kHz (i.e., 146.035, 150.395, etc.) will be replaced. Frequency managers at all levels of command will look for practical, economical opportunities to realign such off-channel frequency assignments. The following special provisions apply to Navy users of LMR frequencies not conforming with the US MCEB 25 kHz channeling plan:

a. <u>Replacing Off-Channel Radio Equipment</u>. When a Navy unit is planning to replace off-channel equipment, the frequency manager will determine whether to obtain an on-channel frequency assignment before ordering the new equipment.

b. <u>Interference to Off-Channel Frequencies</u>. When an off-channel LMR net is receiving interference from an on-channel system and a frequency and a frequency change is the most economical way to solve the problem, the off-channel net will change.

c. <u>Deactivating Off-Channel Nets</u>. If all the equipment on an off-channel net is turned in, the frequency assignment will be deleted immediately. Although the radios may later be issued to another unit or transferred to a new location, the off-channel frequency assignment will not be held in reserve for the new unit, nor will it be reassigned to the new location.

J114. <u>VHF MARITIME MOBILE (MM) FREQUENCIES</u>.

The 156-162 MHz band is allocated primarily for non-government MM communications. Certain channels are available for government use as outlined below (Application and assignment actions are required):

a. Frequency 156.3 MHz may be used for intership simplex communications. Coast Stations may use this channel during emergencies affecting life or property.

b. The 156.6 MHz and 156.7 MHz frequencies may be authorized by coast and ship station for port operation on a simplex basis.

c. Frequency 156.65 MHz is the national navigational frequency. Government ships and coast stations may use it for the maneuvering and safety of ships.

d. Frequency 156.8 MHz is the international MM distress, safety, and calling frequency.

e. Frequencies 157 MHz (ships) and 161.6 MHz (coast stations) may be authorized for duplex port operations.

f. The six channels between 157.0375 MHz and 157.1875 MHz are allocated for government MM operations. Within this band 157.1 MHz is the primary frequency for liaisons communications between ship stations and US Coast Guard stations.

The remaining channels in the MM band (156-162 MHz) are reserved for communications between vessels and designated commercial marine operations and for non-government ship-to-shore and intership operations. Government stations may request the use of specific channels on a case-by case basis if they have a valid need to communicate with the affected non-government licensees.

SUBJECT INDEX

LIST OF ACRONYMS AND ABBREVIATIONS

ADL	Adelie Land
ADN	Aden
ADP	Automatic Data Processing
AFC	Area Frequency Coordinator
AFC	Automatic Frequency Control
AFG	Afghanistan
AFI	French Territory of the Afars and the Issas
AFR	Africa
AFS	Republic of South Africa
AFTRCC	Aerospace and Flight Test Radio Coordinating Council
AGC	Automatic Gain Control
AGL	Angola
AK	Alaska
AL	Alabama
ALG	Algeria (Algerian Democratic and Popular Republic)
AM	Amplitude Modulation
AMS	New Amsterdam Island
AND	Andorra
ANTR	Antarctica
AOE	Spanish Saharan Territory
AR	Arkansas
ARCO	Arctic Ocean
ARG	Argentine Republic
ARS	Kingdom of Saudi Arabia
ASC	Ascension
ASIA	Asia
ASO	South-West Africa
ASR	Airport Surveillance Radars
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
ATDS	Air Tactical Data System
ATN	Netherlands Antilles
AUS	Commonwealth of Australia
AUT	Austria
AX	Aeronautical Fixed Station
AZ	Arizona
AZR	Azores
B	Brazil
BABS	Beam Approach Beacon System
BAH	Bahamas
BC	Broadcasting Station, Sound
BCH	Republic of Botswana
BCS	Broadcast Control Station
BDI	Kingdom of Burundi
BEL	Belgium
BER	Bermuda
BER	Bit-Error Rate
BKS	Broadcast Keying Stations
BLR	Bgelorussian Soviet Socialist
BOL	Bolivia
BOS	Base Operating System
bps	bits per second
BRB	Barbados
BRM	Union of Burma
BRU	Brunei

BT	Broadcasting Station, Television
BUL	Peoples Republic of Bulgaria
C-E	Communications-Electronic
C^3I	Communications, Command and Control, and Intelligence
CA	California
CAF	Central African Republic
CAM	Central America
CAN	Canada
CAR	Caroline Islands
CASREPs	casualty reports
CBN	Caribbean
CCIR	International Radio Consultative Committee
CCITT	International Telegraph and Telephone Consultative Committee
CEOIs	Communications-Electronics Operating Instructions
CGO	Zaire (Republic of)
CHL	Chile (except Easter Island)
CHN	China (Peoples Republic of)
CHR	Christmas Island (Indian Ocean)
CIBs	Communication Information Bulletins
CINCs	Commander-in-Chiefs
CKH	Cook Islands
CKN	Cook Island (Northern Group)
CLM	Republic of Columbia
CLN	Sri Lanka (Ceylon) (Republic of)
CME	Federal Republic of Cameroon
CNO	Chief of Naval Operations
CNR	Canaries
CO	Colorado
COG	Peoples Republic of the Congo
COM	Comoro Islands
CPV	Cape Verde Islands
CRG	Khmer Republic
CSFMP	Combat System Frequency Management Program
CT	Connecticut
CTI	Republic of the Ivory Coast
CTR	Costa Rica
CUB	Cuba
CUDIX	Common User Digital Information Exchange
CVA	Vatican City State
CVSD	Continuous Variable Slope Delta
CWI	Continuous Wave Illumination
CYP	Republic of Cyprus
D	Germany
DAH	Republic of Dahomey
dB	Decibels

DC	District of Columbia
DDN	Defense Data Network
DE	Delaware
DGA	Diego Garcia
DIS	Defense Information System
DISA	Defense Information Systems Agency
DME	Distance Measuring Equipment
DNK	Denmark
DoD	Department of Defense
DOM	Dominican Republic
DON	Department of the Navy
DSC	Digital Selective Calling
DTDMA	Distributed Time Division Multiple Access
E	Spain
EB	Broadcasting-Satellite Space Station (sound broadcasting)
EC	Fixed-Satellite Space Station
ECAC	Electromagnetic Compatibility Analysis Center
ECCM	Electronic Counter-Countermeasures
ECI	Equipment Characteristics Information
ECM	Electronic Countermeasures
ECP	Electromagnetic Compatibility Program
ED	Space Telecommand Space Station
EE	Standard Frequency and Time Signal-Satellite Space Station
EG	Maritime Mobile-Satellite Space Station
EGY	Egypt (Arab Republic of)
EH	Space Research Space Station
EI	Mobile-Satellite Space Station
EJ	Aeronautical Mobile-Satellite Space Station
EK	Space Tracking Space Station
EM	Meteorological-Satellite Space Station
EMC	Electromagnetic Compatibility
EMCAP	Electromagnetic Compatibility Analysis Program
EME	Electromagnetic Environment
EMI	Electromagnetic Interference
EMPASS	Electromagnetic Performance of Aircraft and Ship Systems
E	Radionavigation-Satellite Space Station
EO	Aeronautical Radionavigation- Satellite Space Station

EQ	Maritime Radio-navigation-Satellite Space Station
EQA	Ecuador
ER	Space Telemetering Space Station
ERP	Effective Radiated Power
ES	Inter-Satellite Space Station
ESM	Electronic Support Measures
ET	Space Operation Space Station
ETH	Ethiopia
EU	Land Mobile-Satellite Space Station
EUR	Europe
EV	Broadcasting-Satellite Space Station (television)
EW	Earth Exploration-Satellite Space Station
EX	Experimental Station
F	France
FA	Aeronautical Station
FAA	Federal Aviation Administration
FAB	Aeronautical Broadcast Station
FAC	Airdrome Control Station
FAD	Telecommand Aeronautical Station
FAI	Frequency Application Index
FAL	Frequency Allocation List
FAO	Frequency Action Officer
FAT	Flight Test Station
FB	Base Station
FBD	Telecommand Base Station
FC	Coast Station
FCB	Marine Broadcast Station
FCC	Federal Communications Commission
FCD	Telecommand Coast Station
FD	Aeronautical Station (R)
FDM	Frequency Division Multiplexing
FDR	Frequency-Dependent Rejection
FDRCAL	Frequency Dependent Rejection Calculation Program
FE	Far East
FG	Aeronautical Station (OR
FJI	Fiji Islands
FL	Florida
FL	Land Station
FLD	Telecommand Land Station
FLE	Telemetering Land Station
FLEA	Aeronautical Telemetering Land Station
FLEB	Flight Telemetering Land Station
FLEC	Surface Telemetering Land Station

FLH	Hydrologic and Meteorological Land Station
FLK	Falkland Islands and Dependencies
FLTCINC	Fleet Commander-in-Chief
FLU	Aeronautical Utility Land Station
FM	Frequency Modulation
FNL	Finland
FOT	Optimum Traffic
FP	Frequency Panel
FRRS	Frequency Resource Record System
FSM	Federated States of Micronesia
FX	Fixed Station
FXD	Telecommand Fixed Station
FXE	Telemetering Fixed Station
FXH	Hydrologic and Meteorological Fixed Station
G	United Kingdom of Great Britain and Northern Ireland, Channel Islands, and the Isle of Man
GA	Georgia
GAB	Gabon Republic
GCA	Territories and Colonies of the United Kingdom in Region 1
GCB	Territories and Colonies of the United Kingdom in Region 2
GCC	Territories and Colonies of the United Kingdom in Region 3
GDL	French Department of Guadeloupe
GEOPAC	Geographic Package
GFCS	Gun Fire Control Systems
GHA	Ghana
GHz	Gigahertz
G_i	Isotropic Gain
GIB	Gibraltar
GIL	Gilbert and Ellice Islands
GLM	Gulf of Mexico
GLP	Persian Gulf
GMB	Gambia (Bathurst)
GMF	Government Master File
GNE	Republic of Equatorial Guinea
GNP	Portuguese Guinea
GRC	Greece
GRL	Greenland
GTLK	Great Lakes (collectively)
GTM	Guatemala
GUB	Guyana
GUF	French Department of Guiana
GUI	Republic of Guinea
GUM	Guam
HF	High-Frequency
HI	Hawaii
HKG	Hong Kong
HNB	Belize
HND	Republic of Honduras
HNG	Hungarian Peoples Republic

HOL	Kingdom of the Netherlands
HTI	Republic of Haiti
HVO	Republic of Upper Volta
HWL	Howland Island
Hz	Hertz
I	Italy
IA	Iowa
ICO	Cocos Keeling Islands
ID	Idaho
IF	Intermediate Frequency
IFF	Identification Friend or Foe
IFRB	International Frequency Registration Board
IHAP	Intermodulation and Harmonic Analysis Program
IL	Illinois
ILS	Instrument Landing System
IN	Indiana
IND	Republic of India
INDO	Indian Ocean
INP	Portuguese India
INS	Republic of Indonesia
IOB	British West Indies
IRAC	Interdepartment Radio Advisory Committee
IRL	Ireland
IRN	Iran
IRQ	Republic of Iraq
ISL	Iceland
ISM	Industrial, Scientific, and Medical
ISR	State of Israel
ITU	International Telecommunication Union
IWA	Iwo Jima
J	Japan
JANAP	Joint Army, Navy, and Air Force Publications
JAR	Jarvis Island
JCS	Joint Chiefs of Staff
JETDS	Joint Electronics Type Designation System
JMC	Jamaica
JON	Johnston Island
JOR	Hashemite Kingdom of Jordan
JTIDS	Joint Tactical Information Distribution System
KEN	Kenya
KER	Kerguelen Islands
kHz	Kilohertz
KOR	Republic of Korea
KRE	Peoples Democratic Republic of Korea
KS	Kansas
KWT	State of Kuwait
KY	Kentucky
LA	Louisiana
LAM	Latin America
LANT	Atlantic Ocean
LAO	Kingdom of Laos
LBN	Lebanon
LBY	Libyan Arab Republic
LERI	Lake Erie
LF	Low Frequency

LFM	Linear-Frequency-Modulated
LHUR	Lake Huron
LMIC	Lake Michigan
LMR	Land Mobile Radio
LNR	Republic of Liberia
LONT	Lake Ontario
LORAN	Long-Range Navigational
LOS	Line-of-Sight
LR	Radiolocation Land Station
LRR	Long range radars
LSO	Kingdom of Lesotho
LSUP	Lake Superior
LUF	Lowest Usable High
LUX	Luxembourg
MA	Aircraft Station
MA	Massachusetts
MAC	Macao
MACCS	Marine Aviation Command and Control System
MAD	Telecommand Aircraft Station
MAP	Portable Aircraft Station
MAU	Mauritius
MCO	Monaco
MCS	Marcus Island
MD	Maryland
MDE	Middle East
MDG	Malagasy Republic
MDR	Madeira
MDS	Minimum Discernable Signal
MDW	Midway Islands
ME	Space Station
ME	Maine
MED	Mediterranean Sea
MEX	Mexico
MF	Medium Frequency
MHL	Marshall Islands
MHz	Megahertz
MI	Michigan
MIFASS	Marine Integrated Fire and Air Support System
MIJI	Meaconing, Intrusion, Jamming, and Interference
MILDEP	Military Department
ML	Land Mobile Station
MLA	Malaysia
MLD	Republic of Maldives
MLD	Telecommand Land Mobile Station
MLI	Republic of Mali
MLP	Portable Land Mobile Station
MLS	Microwave Landing Systems
MLT	Malta
MM	Maritime Mobile
MN	Minnesota
MNG	Mongolian Peoples Republic
MO	Missouri
MO	Mobile Station
MOB	Radio Beacon Mobile Station
MOD	Telecommand Mobile Station
MOE	Telemetering Mobile Station

MOEA	Aeronautical Telemetering Mobile Station
MOEB	Flight Telemetering Mobile Station
MOEC	Surface Telemetering Mobile Station
MOH	Hydrologic and Meteorological Mobile Station
MOP	Portable Mobile Station
MOU	Aeronautical Utility Mobile Station
MOZ	Mozambique
MR	Radiolocation Mobile Station
MRA	Mariana Islands (except Guam)
MRC	Kingdom of Morocco
MRL	Marshall Islands
MRN	Marion Islands
MRP	Portable Radiolocation Station
MRT	French Department of Martinique
MS	Ship Station
MS	Mississippi
MSD	Telecommand Ship Station
MSL	mean sea level
MSP	Portable Ship Station
MT	Montana
MTN	Islamic Republic of Mauritania
MUF	Maximum Usable High
MWI	Malawi
NAM	North America
NAVAID	Navigational Aids
NAVCOMTELSTAs	Naval Computer and Telecommunication Stations
NAVEMSCEN	Naval Electromagnetic Spectrum Center
NBDP	Narrow-Band Direct-Printing
NBS	National Bureau of Standards
NC	North Carolina
NCG	Nicaragua
NCL	New Caledonia and Dependencies
NCS	National Communications System
NCTAMS	Naval Computer and Telecommunication Area Master Station
ND	North Dakota
NE	Nebraska
NE	Near East
NGR	Republic of the Niger
NGU	Territory of New Guinea
NH	New Hampshire
NHB	New Hebrides (British-French Condominium)
NIG	Federal Republic of Nigeria
NIU	Niue Island
NJ	New Jersey
NM	New Mexico
NMCS	National Military Command System
NOR	Norway
NPL	Nepal
NR	Radionavigation

	Mobile Station
NRU	Nauru Island
NSA	National Security Agency
NTDS	Naval Tactical Data System
NTIA	National Telecommuni- cation and Information Administration
NTS	Naval Telecom- munication Systems
NV	Nevada
NWP	Naval Warfare Publication
NY	New York
NZL	New Zealand
OCE	French Polynesia
OCNA	Oceania
OD	Oceanographic Data Station
OE	Oceanographic Data Interro- gating Station
OH	Ohio
OIS	Oblique Inci- dence Sounding
OK	Oklahoma
OMB	Office of Management and Budget
OR	Oregon
OTC	Officer in Tac- tical Command
OUS&P	Outside US&P
PA	Pennsylvania
PAC	Pacific Ocean
PAK	Pakistan
PAP	Territory of Papua
PAQ	Easter Island, Chili
PAR	Precision approach radars
PD	Pulse Duration(s)
PDP	Power Density Program
PEP	Peak Envelope Power
PHL	Republic of the Philippines
PHX	Phoenix Islands
Plan	PLAD Language Address
PLM	Palmyra Island
PN	pseudonoise
PNR	Panama
PNZ	Panama Canal Zone
POL	Peoples Repub- lic of Poland
POR	Portugal
PPM	Parts Per Million
PPS	Pulses Per Second
PRG	Paraguay
PRR	Pulse Repeti- tion Rate(s)
PRU	Peru
PTC	Pitcairn Island
PTR	Puerto Rico
RA	Radio Astronomy Station
RACES	Radio Amateur Civil Emergency Services
RACON	Radar Beacons
RADHAZ	Radiation Hazard
RDT&E	Research, Development, Test and Evaluation
REU	French Depart- ment of Reunion
RFI	Radio Frequency Interference
RFQ	Request for Quotation
RG	Radio- Direction- Finding Station
RHS	Rhodesia

RI	Rhode Island
RL	Radionavigation Land Station
RLA	Aeronautical Marker Beacon Station
RLB	Aeronautical Radiobeacon Station
RLC	Radar Beacon Station (racon)
RLG	Glide Path (Slope Station)
RLL	Localizer Station
RLM	Marine Radiobeacon Station
RLN	Loran Station
RLO	Omnidirectional Range Station
RLR	Radio Range Station
RLS	Surveillance Radar Station
RLTM	Radionavigation Land Test Station (Maintenance Test Facility
RLTO	Radionavigation Land Test Station (Operational Test Facility
ROA	Altimeter Station
ROD	Rodriguez
ROU	Socialist Republic of Romania
RRW	Republic of Ruands
RUC	Reporting Unit Codes
RWI	Radio-Wire-Integration
RYU	Ryukyu Islands
S/N	Signal-to-Noise Ratio
S	Sweden
SAFM	Special Assistant for Frequency Management
SAM	South America
SAS	South Asia
SAUF	Spectrum Allocation and Use File
SC	South Carolina
SD	South Dakota
SDC	Space Defense Center
SDN	Republic of Sudan
SEA	South East Asia
SEN	Republic of Senegal
SEY	Seychelles
SFAF	Standard Frequency Action Format
SHN	S. Helena
SIF	Selective IFF
SINAD	Signal-to-Interference-Plus-Noise and Distortion Ratio
SLM	Solomon Islands
SLV	Republic of El Salvador
SMA	American Samoa
SMO	Western Samoa
SMR	Republic of San Marino
SN	Sounder Network Station
SNG	Republic of Singapore
SOM	Somali Democratic Republic
SOW	Statement of Work

SP	Sounder Prediction Station
SPCE	Space
SPM	St. Pierre and Miquelon
SPS	Spectrum Planning Subcommittee
SRL	Sierra Leone
SS	Standard Frequency and Time Signal Stations
SSB	Single-Sideband
STP	Sao Tome and Principe
SUI	Confederation of Switzerland
SUMS	Spectrum Use Management System
SUR	Surinam
SWN	Swan Island
SWZ	Kingdom of Swaziland
SYR	Syrian Arab Republic
TACAN	Tactical Air Navigation
TACDB	Tactical Data Base
TAI	Taiwan
TAOC	Tactical Air Operations Center
TB	Aeronautical Mobile-Satellite Earth
TC	Fixed-Satellite Earth Station
TCD	Republic of the Chad
TCH	Czechoslovak Socialist Republic
TCTD	Space Telecommand Earth Station (Fixed-Satellite Service (Fixed-Satellite
TD	Space Telecommand Earth Station
TDM	Time Division Multiplexing
TDMA	Time Division Multiple Access
TE	Satellite EPIRB Station
TETK	Space Tracking Transmitting Earth Station (Emerg Position-Indicating Radio Beacon: EPIRB)
TETR	Space Telemetering Transmitting Earth Station for (EPIRB)
TFMS	Tactical Frequency Management System
TG	Maritime Mobile-Satellite Ship Earth Station
TGK	United Republic of Tanzania (Tanganyika)
TGO	Togolese Republic
TH	Space Research Earth Station
THA	Thailand
TI	Maritime Mobile-Satellite Coast Earth Station

TJ	Aeronautical Mobile-Satellite Aircraft Earth Station
TK	Space Tracking Earth Station
TKL	Tokelau Islands
TM	Meteorological-Satellite Earth Station
TMP	Portuguese Tiwaziland Portuguese Timor
TN	Radionavigation-Satellite Fixed Earth Station
TN	Tennessee
TO	Aeronautical Radionavigation-Satellite Mobile Earth Station
TON	Tonga (Kingdom of)
TP	Earth Station (receiving
TQ	Maritime Radionavigation-Satellite Mobile Earth Station
TR	Space Telemetering Earth Station
TRC	Tristan Da Cunha (Station of the Republic of South Africa)
TRD	Trinidad and Tobago
TRF	Tuned Radio Frequency
TT	Space Operation Earth Station
TUN	Tunisia
TUR	Turkey
TW	Earth Exploration-Satellite Earth Station
TWT	Traveling Wave Tube
TX	Maritime Radionavigation-Satellite Earth Station
TX	Texas
TY	Land-Mobile Satellite Earth Station
TZ	Aeronautical Radio-navigation Satellite Earth Station
UA	Mobile-Satellite Service Mobile Earth Station
UGA	Uganda
UGT	Universal Greenwich Time
UIC	Unit Identification Code
UKR	Ukrainian Soviet Socialist Republic
U	Radion-navigation-Satellite Mobile Earth Station
URG	Oriental Republic of Uruguay
URS	Union of Soviet Socialist Republic
US	50 United States and the District of Columbia
US&P	United States and Possessions

USA	The 48 Contiguous States of the United States of America and the District of Columbia (excludes the states of Alaska and Hawaii)
USMCEB	United States Military Communications-Electronics Board
USP	The United States (50 states and the District of Columbia), the Commonwealth of Puerto Rico, and the Territories and Possessions (but less the Canal Zone)
UT	Utah
UTC	Universal Coordinated Time
UTM	Universal Transverse Mercator
VA	Land Earth Station
VA	Virginia
VEN	Venezuela
VHF	Very High Frequency
VIR	Virgin Islands
VIS	Vertical Incidence Sounding
VOR	VHF Omnidirectional Range
VT	Vermont
VTN	Republic of Viet-Nam
WA	Washington

WAK	Wake Island
WAL	Wallis and Futuna Island
WI	Wisconsin
WV	West Virginia
WXB	Radar Beacon Precipitation Gage Station
WXD	Meteorological Radar Station
WAR	Radiosonde Station
WXRG	Radiosonde Ground Station
WY	Wyoming
XC	Experimental Contract Developmental Station
XD	Experimental Developmental Station
XE	Experimental Export Station
XM	Experimental Composite Station
XR	Experimental Research Station
XT	Experimental Testing Station
XTAL	Crystal
YEM	Yemen Arab Republic
YMS	Yemen (Peoples Democratic Republic of)
YUG	Federal Socialist Republic of Yugoslavia
YYMM	Year, Month
YYMMDD	Year, Month,Day
ZAN	United Republic of Tanzania (Zanzibar)
ZMB	Republic of Zambia

LIST OF CURRENT DEPARTMENT OF THE NAVY ELECTROMAGNETIC SPECTRUM MANAGEMENT PUBLICATIONS

SECNAVINST 2410.1B, 17 OCT 67, With Change 1, 13 Dec 72- "Electromagnetic Compatibility Program Within the Department of the Navy, Policy Direction."

OPNAVINST 2400.24A, 4 Nov 80, with Changes w, e, and e, 10 Jan 83- "Provisions for U.S. Navy Use of Maritime Mobile UHF Radiotelephone Services in the 156-162 MHz Band."

OPNAVINST 2400.20E, 19 Jan 89- "Management and Use of the Radio Frequency Spectrum Within the Department of the Navy."

OPNAVINST 2400.25, 4 Aug 83- "National Emergency Readiness Plan for the Use of the Radio Spectrum."

OPNAVINST 2410.31D, 6 Aug 84- "Electromagnetic Compatibility Program Within the Department of the Navy."

OPNAVINST 3430.9C, 6 Dec 78, with Changes 1 and 2, 17 Aug 83- "Performing Electronic Countermeasures in the United States and Canada."

OPNAVINST 3430.18C, 3 Aug 84- "Reporting Meaconing, Intrusion, Jamming, and Interference of Electromagnetic Systems; Reports Control Symbol: JCS-1066 (MIN)."

OPNAVINST 3430.19B, 15 Mar 82- "Electromagnetic Performance of Aircraft and Ship Systems (EMPASS); Procedure for Obtaining Services of."

OPNAVNOTE 2400, 7 Dec 81- "Electromagnetic Emission Designators."

OPNAVNOTE 2800, 21 Sep 84- "Acquisition and Use of Commercial Data Encryption Standard, DES, Equipment."

NAVTELCOMINST 5450.52, 23 Apr 84- "Mission and Functions Assigned to Naval Electromagnetic Spectrum Center, NAVEMSCEN."

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